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REPORT ON IMMEDIATE WATER POLLUTION CONTROL NEEDS, INTERSTATE WATERS. NEW ENGLAND RIVER BASINS, NORTHERN AREA

Federal Water Pollution Control Administration
Boston, Massachusetts

June 1967

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NEW ENGLAND RIVER BASINS

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REPORT ON
IMMEDIATE WATER POLLUTION CONTROL NEEDS

INTERSTATE WATERS

New England River Basins
NORTHERN AREA

June 1967

ERRATA

August 1967

Report on Immediate Water Pollution Control Needs,
Interstate Waters, New England River Basins,
Northern Area, June 1967

Page	Table	Line	Change	
I-6		1	Reads:	$226,000,000
			Should read:	$219,000,000
I-6		15	Estimated cost for the Piscataqua River Basin reads:	$16,000,000
			Should read:	$11,000,000
I-6			Estimated total cost reads:	$224,000,000
			Should read:	$219,000,000
IV-3		2	Reads:	$48,000,000
			Should read:	$51,000,000
IV-3		5	Reads:	$18,000,000
			Should read:	$14,000,000
VI-7	VI-2		Estimated total cost reads:	$16,105,000
			Should read:	$15,231,000
VIII-5		12	Reads:	Saco River
			Should read:	South Maine Coastal
VIII-5		13	Reads:	$7,000,000
			Should read:	$32,000,000
IX-1		24	Reads:	$16,000,000
			Should read:	$11,000,000
IX-6		12	Reads:	$16,000,000
			Should read:	$11,000,000
IX-8	IX-3		Estimated total cost (Table IX-3) reads:	$10,979,000
			Should read:	$5,515,000
IX-8	IX-3		Estimated total cost reads:	$16,443,000
			Should read:	$10,979,000

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CHAPTER I
INTRODUCTION

OBJECTIVES AND SCOPE

This report presents guidelines for an evaluation of the initial phases of a comprehensive action water pollution control and water quality management program for the New England River Basins. The report's objectives are to delineate areas of present water quality problems, actions required to improve water quality, and estimated costs to implement the required actions.

The geographical area covered in this report is that portion of New England referred to as the Northern Area and defined in Figure I-1. The portion of New England referred to as the Southern Area (also shown in Figure I-1) is covered in the Report on Immediate Water Pollution Control Needs, Interstate Waters, New England River Basins, Southern Area.

The Northern Area includes the interstate drainage basins in Maine and in the eastern part of New Hampshire. Streams within the scope of this report include those waters defined as interstate, within the water quality standards provisions of the Federal Water Pollution Control Act. These interstate waters include those which flow across or form part of a state or international boundary, coastal waters, and reaches of coastal streams subject to the ebb and flow of the tides. Intrastate streams are not within the scope of this report.

The recommendations presented herein are based on preliminary evaluations and analyses of existing published data such as engineering reports, state classification reports and reports prepared by federal agencies, and will be revised when more complete information is assembled. A judgement has been made in accordance with the Guidelines for Establishing Water Quality Standards for Interstate Waters that secondary treatment is uniformly required throughout the area. For purposes of clarity, the term secondary treatment used in this report is defined as a process or series of processes capable of removing at least ninety per cent of the biochemical oxygen demand of a waste, and including the proper disenfection of all effluents containing sewage. The omission of a recommendation for any particular town, industry or other establishment does not imply that an immediate or potential pollution abatement need does not exist.

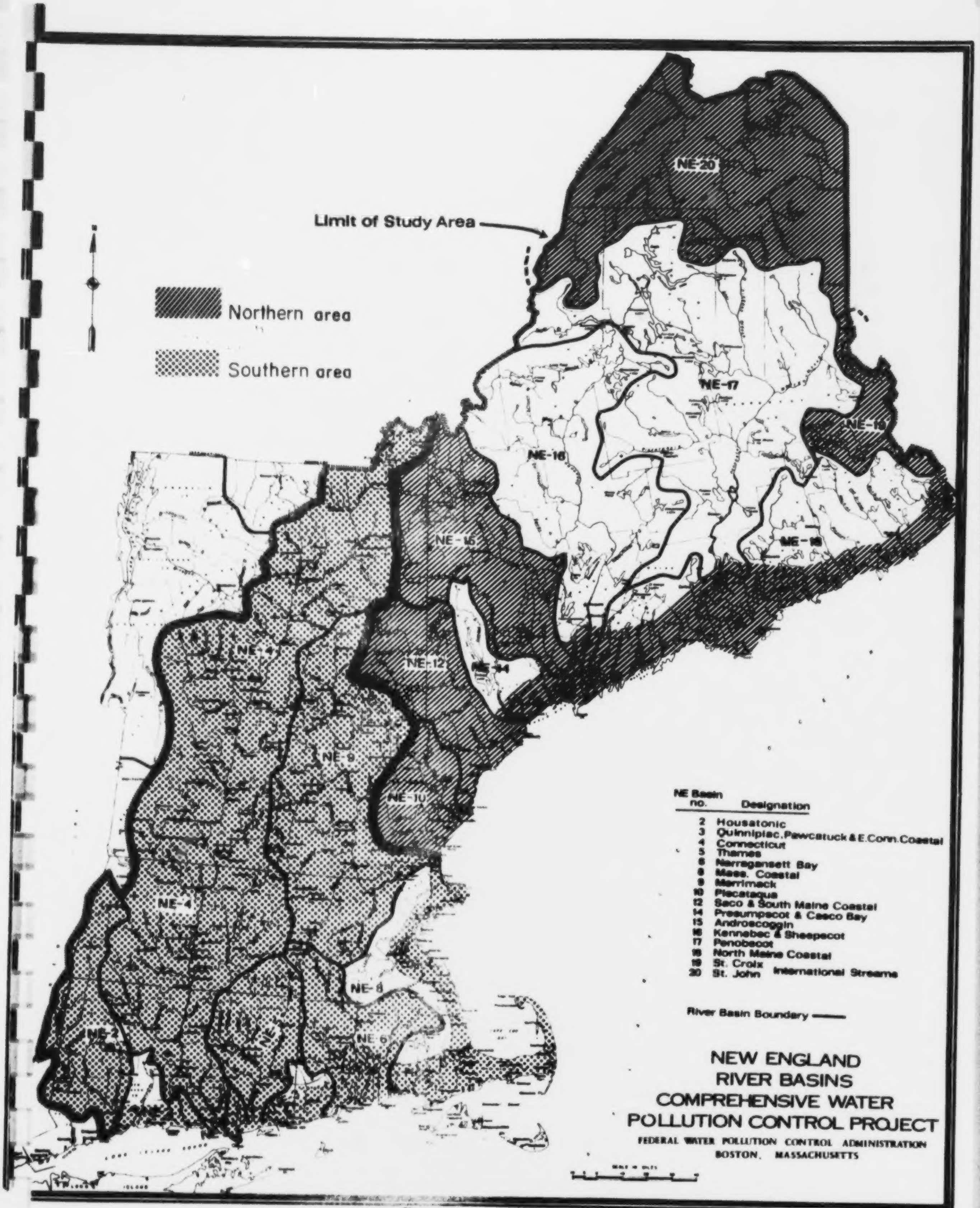
Priorities for pollution abatement were developed on the basis of the following objectives and in the following sequence:

Elimination of all nuisance conditions on the interstate river system of a basin.

Returning as many miles of river as possible to all legitimate water uses.

Recommended priorities assigned to each individual source of pollution reflect the individual polluter's relative impact on the quality of the river. Priorities listed are based solely on an evaluation of the pollution problems of the interstate waters of a particular basin, and not on a relative basis with other basins.

Cost estimates have been presented, however, their purpose and value lie in establishing an order of magnitude of the required financial investment needed to abate pollution on the interstate streams of a specific basin. The costs, as presented, may vary from those developed as a result of detailed design studies of specific treatment facilities. Cost estimates for management procedures, institutional practices, and research needs have not been included in this report.


Limit of Study Area
Northern area
Southern area
NE-20
NE-17
NE-18
NE-19
NE-16
NE-15
NE-14
NE-12
NE-10
NE-9
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River Basin Boundary
NEW ENGLAND RIVER BASINS COMPREHENSIVE WATER POLLUTION CONTROL PROJECT
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
BOSTON, MASSACHUSETTS

NE Basin no.	Designation
2	Housatonic
3	Quinnipiac, Pawcatuck & E. Conn. Coastal
4	Connecticut
5	Thames
6	Narragansett Bay
8	Mass. Coastal
9	Merrimack
10	Piscataqua
12	Saco & South Maine Coastal
14	Presumpscot & Casco Bay
15	Androscoggin
16	Kennebec & Sheepscot
17	Penobscot
18	North Maine Coastal
19	St. Croix International Streams
20	St. John International Streams

FIGURE I-1

AUTHORITY

Under Section 3 (a) of the Federal Water Pollution Control Act, the Secretary of Interior is directed to prepare or develop comprehensive water pollution control programs in cooperation with other Federal agencies, State water pollution control agencies and interstate agencies, and municipalities and industries involved. These programs formulate and implement plans for the elimination or reduction of water pollution of interstate waters and their tributaries and the improvement of the sanitary condition of surface and underground waters.

ACKNOWLEDGMENTS

The staff preparing this report gratefully acknowledges the cooperation of the personnel of the Maine Water Improvement Commission and the New Hampshire Water Pollution Commission.

SUMMARY AND RECOMMENDATIONS

In certain reaches, the interstate waters of the Northern Area are badly degraded by industrial and municipal waste discharges. The resulting degradation prevents or hampers the use of reaches of the interstate streams for such legitimate uses as recreation, water supply, aesthetic appreciation, fishing and fish propogation, and shellfish harvesting. In some interstate waters, reaches are degraded to such an extent that nuisance conditions exist. In many streams, this degraded quality can be attributed to industrial waste discharges of the paper, textile and food processing industries, while in other streams municipal and industrial wastes are additive factors in the degraded quality.

Although the pollution contributed by some of the intrastate tributaries of the interstate streams in the Northern Area may prevent the complete upgrading of the water quality of the main stem, secondary treatment is recommended as the minimum required upgrading action for all wastes discharged to the interstate waters.

Certain sources of pollution within each basin are considered to have a greater effect on the water quality than other sources. In each basin, therefore, a priority has been established for each pollution source after considering, in order, the source's contribution to nuisance conditions in the river and then the source's effect on the restriction of legitimate uses of the water over large reaches of the river. A more detailed summary of pollution problems, water quality, and the priorities established for each interstate water is included in subsequent chapters.

The cost of pollution abatement of the interstate waters of the

Northern Area is estimated at approximately $226,000,000, based on provisions for secondary treatment of all waste discharges. Estimated costs for municipal waste sources are based on providing waste treatment facilities and interceptors, where required; however, cost estimates for industrial waste sources are based on waste treatment facilities only. The estimated costs for each basin in the Northern Area are as follows:

Basin	Estimated Cost
St. John River	$ 40,000,000
St. Croix River	5,000,000
North Maine Coastal	65,000,000
Androscoggin River	44,000,000
Casco Bay Coastal	15,000,000
Saco River	7,000,000
South Maine Coastal	32,000,000
Piscataqua River	16,000,000
Total	$224,000,000

In addition, there are certain needs of a broader nature applicable to the Northern Area as a whole. These needs and their priorities are as follows:

Responsibility	Need	Priority
FWPCA Me., N. H. NEIWPCC Municipalities Industries	Define and develop a water quality management program including required institutional framework needs, pollution control needs, complex water quality evaluation models, financial arrangements and basin management surveillance systems. This program should be developed with the state water pollution control agencies, municipalities and industries, and the New England Interstate Water Pollution Control Commission. The program is to recognize the economic, sociological, land use and political power structure of the region.	A

Responsibility	Need	Priority
Me., N. H. Industries	Prepare and maintain an inventory of municipal and industrial waste sources discharging treated or untreated effluents to interstate and coastal waters.	A
FWPCA	Define the needs and develop the organizational capabilities required to a. Administer the dictates of the Oil Pollution Act of 1924 as amended by the Clean Water Restoration Act of 1966. b. Eliminate the discharge of untreated sanitary wastes from ships and boats.	A
Me., N. H.	Proceed to adopt enforceable water quality standards for interstate streams in accordance with the Federal Water Pollution Control Act.	A
Me., N. H.	Provide for an expanded staff to adequately implement the water pollution control program.	A
Me., N. H.	Take part more actively in the review of the initial applications for and the renewal of Federal Power Commission licenses in view of the effect that the granting of these licenses might have on low flow regulations and water quality requirements.	A
Me., N. H.	Develop training programs for present and future treatment plant operations.	A
Me., N. H.	Proceed to adopt enforceable water quality standards for intrastate waters in the interest of protecting water uses and developing a firm and consistent pollution control program for the waters of the entire state.	B
Me., N. H.	Provide assistance in the development of institutional arrangements that may bring communities and industries together for the purpose of	B

Responsibility	Need	Priority
	planning and financing pollution control measures.	
Industries	Expand research to determine more effective and economical ways of reducing industrial waste loads, especially the pulp and paper, textile and food processing industries.	A

CHAPTER II
ST. JOHN RIVER BASIN

SUMMARY

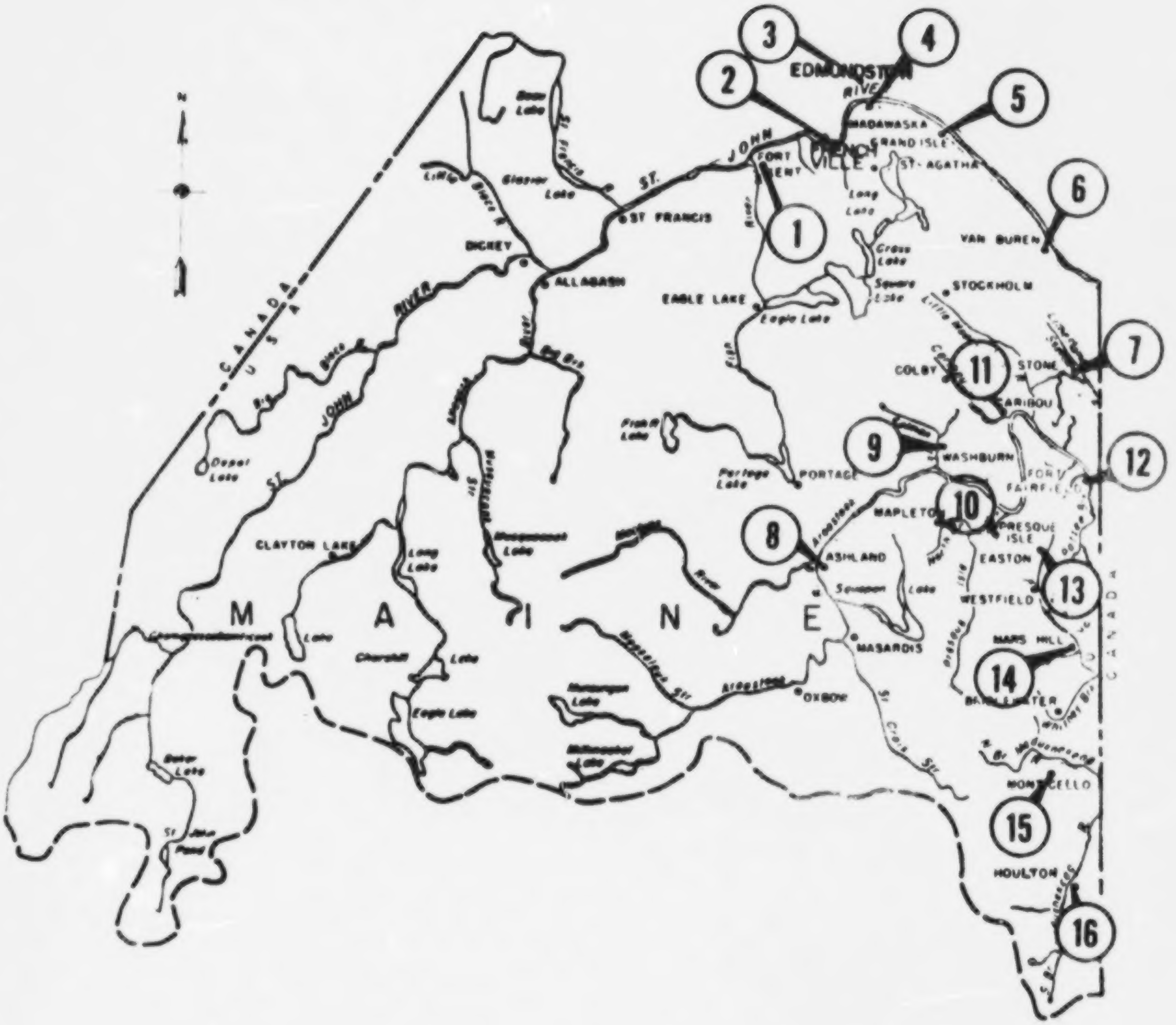
Major water quality problems impair the use of the interstate waters of the St. John River Basin. Raw waste discharges and inadequately treated discharges from industries and municipalities result in significant water quality degradation along appreciable distances of a number of interstate streams. The total BOD (biochemical oxygen demand) discharged to the interstate rivers of this basin is estimated at approximately 2,000,000 P.E. (population equivalents).

Industrial operations along the interstate streams include potato starch plants, food processing plants and a pulp and paper mill, all of which contribute about 95 percent of the total BOD load discharged to the basins' interstate streams. The largest single pollution source is the Fraser Paper Company Ltd. in Madawaska, Maine, and Edmundston, New Brunswick. This industry contributes more than 50 percent of the basins' entire BOD load and greater than 90 percent of the BOD load discharged directly to the St. John River. The starch and food processing plants contribute about 35 percent of the BOD load discharged directly to other interstate streams in the basin.

The major municipalities in the basin, lying along the banks of interstate streams, contribute only relatively small waste loads compared to those from industry.

Evaluation of water quality problem areas of interstate streams indicate that immediate pollution control programs should be directed toward the industrial sources along the interstate streams. This pollution abatement will require a minimum expenditure of approximately $40,000,000 by towns and industries discharging wastes directly to interstate waters.

Immediate water pollution control needs, geographically pinpointed in Figure II-1, are summarized in Table II-1. The priorities recommended were chosen on the basis of relative importance in upgrading large reaches of the streams. These priorities, however, are not intended to prevent or delay the initiation or completion of independent pollution control programs by either municipalities or industries.


N
CANADA
U.S.A.
EDMONDSTON
RIVER
MADAWASKA
GRAND ISLE
FRENCHVILLE
ST. AGATHA
FORT KENT
ST. JOHN
ST. FRANCIS
DICKEY
ALLAGASH
VAN BUREN
EAGLE LAKE
Eagle Lake
Long Lake
Cross Lake
Square Lake
STOCKHOLM
COLBY
STONE
CARIBOU
WASHBURN
PORTAGE
Portage Lake
FORT FAIRFIELD
MAPLETON
PRESQUE ISLE
ASHLAND
EASTON
WESTFIELD
MARS HILL
BRIDGEWATER
MASARDIS
OXBOW
Squapan Lake
St. Croix Str.
MONTICELLO
HOULTON
CLAYTON LAKE
Depot Lake
Long Lake
Chamberlain Lake
Eagle Lake
Munsungan Lake
Millinocket Lake
Baker Lake
St. John Pond
Glazier Lake
Baker Lake
Aroostook
M A I N E
1
2
3
4
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15
16

LEGEND

① Location of Immediate Water Pollution Control Need

NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM
ST. JOHN RIVER BASIN

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION BOSTON, MASS.

FIGURE II-1

SCALE IN MILES

Table II-1

ST. JOHN RIVER BASIN

St. John, Aroostook and Meduxnekeag Rivers and Limestone and Prestile Streams

Summary of Immediate Water Pollution Control Needs

Location Map Key No.	Responsibility	Need	Priority[1]
3,4	Fraser Paper Co., Ltd., at Madawaska, Me., & Edmundston, N. B.	Secondary Waste Treatment	A
4	Town of Madawaska, Me.	"	A
7	Eastern Maine Starch Co. at Limestone, Me.	"	A
10	Presque Isle Starch Co. and Potato Service, Inc., at Presque Isle	"	A
10	City of Presque Isle, Me.	"	A
13	Vahlsing, Inc., potato processing plant and sugar beet refinery at Easton, Me.	"	A
16	Starch plant at Houlton, Me.	"	A
1	Two starch plants at Ft. Kent, Me., State Teachers College at Ft. Kent, Me.	"	B
1	Town of Ft. Kent, Me.	"	B
2	Starch plant at Frenchville, Me.	"	B
5	Grand Isle Starch Co. at Grand Isle, Me.	"	B
6	Beaver Brook Starch Company at Van Buren, Me.	"	B
9	Taterstate Co. and A. E. Staley Mfg. Co. at Washburn, Me.	"	B

Table II-1 (Continued)

Location Map Key No.	Responsibility	Need	Priority[1]
11	Birds Eye at Caribou, Me.	Secondary Waste Treatment	B
11	Town of Caribou, Me.	"	B
12	Beaver Brook Starch Co. and A & P Co. at Ft. Fairfield, Me.	"	B
15	Powers Starch Co. at Monticello, Me.	"	B
6	Town of Van Buren, Me.	"	C
8	Town of Ashland, Me.	Disinfection	C
9	Town of Washburn, Me.	Secondary Waste Treatment	C
14	Town of Mars Hill, Me.	"	C
16	Town of Houlton, Me.	"	C
--	International Joint Commission	Establish necessary liaison with State of Maine to aid in establishing water quality standards and implementing pollution abatement program for boundary waters of St. John River.	A

---

[1] Priorities of action are divided into three categories based on their impact on water quality improvements.

IMMEDIATE POLLUTION CONTROL NEEDS

Since most of the total waste load in each of the interstate rivers in the basin is contributed by starch plants, food processing plants and pulp and paper mills, they should be the recipients of immediate pollution abatement measures. In view of the magnitude of the pollutional loads from these sources, abatement measures should be immediate waste treatment by secondary or equivalent methods.

The St. John River, the major stream in the basin, is seriously degraded to a Class D[1] quality below Madawaska, Maine, by discharges from starch plants at Ft. Kent and Frenchville, Maine, and by the Fraser Paper Company at Madawaska, Maine, and Edmundston, New Brunswick. Immediate pollution control actions should therefore be directed toward these polluters.

Since some of the larger population centers in the St. John River Basin are located along the banks of the Aroostook River, a priority is considered to exist where the quality of the Aroostook River affects these population centers. Degradation of reaches of the Aroostook River is caused primarily by a number of starch plants, food processing plants, and municipalities. Although the municipalities do contribute to the degradation, their proportion of contributed wastes is overshadowed by the amount of wastes from industrial sources. Inasmuch as the two largest towns currently have primary facilities, the greatest abatement emphasis should

---

1. Based upon New England Interstate Water Pollution Control Commission Water Quality Standards shown in Appendix A.

be directed toward the potato and food processing plants in Washburn, Presque Isle, Caribou and Ft. Fairfield, Maine.

The Prestile Stream is presently degraded to a nuisance quality by wastes from the Vahlsing, Inc., potato processing plant and sugar beet refinery at Easton, Maine. This constitutes a significant waste load and points to the immediate need for abatement of pollution from this source. In view of the large pollutional load which may be expected, even after a relatively high degree of treatment, and the flow conditions of the stream, special studies should be conducted to determine methods of adequate pollution abatement.

The South Branch and the main stem of the Meduxnekeag River is degraded from the Town of Carry Mills located about 3 miles upstream of Houlten, Maine to the international border. As a result, complaints have been received from Canadian interest. Since the chief source of degradation is a starch plant at Carry Mills, Maine, an immediate control or abatement project at this source of pollution will significantly improve the river's quality before entering Canada.

Similarly, the Limestone Stream below Limestone, Maine, is degraded to Class D primarily by the Eastern Maine Starch Company at Limestone. Abatement of pollution from this source will upgrade the stream's quality before it enters Canada.

Further abatement measures are recommended for locations where other potato starch or food processing plants discharge wastes directly to interstate waters. Abatement of these sources will result in essentially complete abatement of major sources of pollution. A number of the communities along the rivers, although they do contribute pollution, are not considered significant sources; abatement of these municipal sources should be considered after the industrial sources are controlled. Engineering studies, however, may indicate that economies will result by combining the wastes of these smaller towns with that of industrial treatment facilities.

In addition to the pollution abatement programs which are the responsibility of the appropriate industry or municipality, the most pressing need is the adoption of an enforceable classification system for the St. John River.

COSTS

Estimates of costs for recommended pollution abatement measures have been based on provisions for secondary treatment, including disinfection of all sewage waste discharges. The estimates, shown in Table II-2 and Table II-3 were prepared by FWPCA utilizing costs obtained from consulting engineering and state classification reports, state agencies, and generalized treatment plant cost curves. These costs have been adjusted where necessary. The estimates serve only to indicate the order of magnitude of financial investment needed to abate pollution on the interstate streams of a basin and do not replace the more detailed estimates developed as the result of engineering studies for specific municipalities or industries. Pollution abatement facilities for sources discharging wastes to the interstate waters of the St. John River Basin will require a minimum expenditure of approximately $40,000,000.

Estimates for institutional practices recommended in the SUMMARY section of this chapter have not been presented.

Table II-2

ST. JOHN RIVER BASIN

St. John River
Recommended Abatement Measures and Estimated Costs

Source[1]	Recommended Treatment	Estimated Cost[2]	Remarks
Ft. Kent, Me. (M & I)	Secondary	$ 1,000,000	
Starch Plant	"	*	*Included with Ft. Kent
Starch Plant	"	*	* " " " "
State College	"	*	* " " " "
Frenchville, Me.	-	-	
Starch Plant (I)	"	2,000,000	
Madawaska, Me. (M)	"	1,450,000	
Fraser Paper Co. (I)	"	*	*Included with Madawaska
Edmundston, N. B. (M)	Undet.	Undet.	
Fraser Paper Co. (I)	Undet.	18,000,000	
Grand Isle, Me.	-	-	
Grand Isle Starch Co. (I)	Secondary	271,000	
Van Buren, Me. (M)	"	828,000	
Beaver Brook Starch Co. (I)	"	425,000	
Total (Table II-2)		$23,974,000	

---

1. Parenthetical M and I following the listed waste source indicate municipal or industrial sources, respectively.

2. Estimated costs for municipal waste sources include costs for waste treatment facilities and interceptors where required. Estimated costs for industrial waste sources include costs for waste treatment facilities only.

Table II-3

ST. JOHN RIVER BASIN

Interstate Tributaries
Aroostook and Meduxnekeag Rivers and Prestile and Limestone Streams

Recommended Abatement Measures and Estimated Costs

Source[1]	Recommended Treatment	Estimated Cost[2]	Remarks
Aroostook River			
Washburn, Me. (M)	Secondary	$ 606,000	
Taterstate Co. (I)	"	*	*Included with Washburn
A. E. Staley Co. (I)	"	*	*Included with Washburn
Presque Isle, Me. (M)	"	616,000	
Presque Isle Starch Co. (I)	"	*	*Included with Presque Isle
Potato Services, Inc. (I)	"	290,000	
Caribou, Me. (M)	"	2,350,000	
Birds Eye (I)	"	*	*Included with Caribou
Ft. Fairfield, Me. (M)	"	310,000	
Beaver Brook Starch Co.	"	910,000	
A & P Co.	"	1,800,000	
Meduxnekeag River (North Branch)			
Monticello, Me.			
Powers Starch Co.	"	271,000	
Meduxnekeag River (South Branch)			
Hodgdon, Me.			
Hodgdon School	Subsurface Disp.	5,000	
Houlton, Me. (M)	Secondary	2,000,000	
Starch Factory (I)	"	2,700,000	
Prestile Stream			
Easton, Me.			
Vahlsing, Inc.	Secondary	4,000,000	

Table II-3 (Continued)

Source[1]	Recommended Treatment	Estimated Cost[2]	Remarks
Limestone Stream			
Limestone, Me.			
Eastern Maine Starch Co. (I)	Secondary	$ 190,000	
Total (Table II-3)		16,048,000	
Total (Table II-2)		23,974,000	
Total		$40,022,000	

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1. Parenthetical M and I following the listed waste source indicate municipal or industrial sources, respectively.

2. Estimated costs for municipal waste sources include costs for waste treatment facilities and interceptors, where required. Estimated costs for industrial waste sources include costs for waste treatment facilities only.

RECENT PROGRESS IN POLLUTION CONTROL

The pollution problems of the interstate rivers of the St. John River Basin have received a moderate amount of recognition, focused primarily on some of the smaller interstate streams. Major polluters on these streams have received attention by the Maine Water Improvement Commission and by the Maine Legislature, which has taken the form of the adoption of stream classifications and legal action against certain polluters.

The Aroostook River, Limestone Stream, Prestile Stream and the branches of the Meduxnekeag River are presently classified by legislation. Recommendations, made by the Maine Water Improvement Commission pertaining to reaches of the Aroostook River, Limestone Stream and Prestile Stream, are that certain reaches of these waters, presently classified Class D, be upgraded to a Class C quality. These recommendations were adopted by the Legislature in 1967.

At the present time, classification of the St. John River is in progress by the State of Maine.

The Maine Water Improvement Commission has brought action against certain polluters. Specifically, the B-2 classification of the Prestile Stream was violated in 1962 by the start of operations of the Vahlsing, Inc., potato processing plant at Easton, Maine. An abatement order by the Water Improvement Commission in 1963 resulted in the installation of an unapproved treatment plant. In 1965, the Maine Legislature lowered the classification of this stream to Class D to allow the construction of and subsequent waste discharge from a sugar beet refinery owned by the Vahlsing

Corporation. In 1965, further violations of the lowered classification resulted in a request to the Maine Attorney General to take legal action. The outcome of the following negotiations was the initiation of an engineering study to consider the problem of waste treatment from the potato-sugar beet complex at Easton, Maine. In this respect, the FWPCA awarded a research and development grant in the amount of $196,000 to Vahlsing, Inc., to demonstrate the feasibility of treating potato processing waste by activated sludge and to further demonstrate the feasibility of combining potato processing wastes with sugar beet refining wastes.

The waste discharge from the starch plant of the Westfield Starch Company was discontinued in 1963 after an order to abate, and the town of Mars Hill was ordered to abate pollution in 1960. Following this latter order, a primary municipal treatment facility was constructed in 1963 at a cost of $254,000.

In 1959, the disposal of potato pomace wastes into Limestone Stream by a plant at Limestone, Maine, was stopped by order of the Water Improvement Commission. In 1966, wastes discharged from the starch plant created nuisance conditions in the Limestone Stream. Action by the Commission resulted in court action and the levying of a fine against the plant. Municipalities along this stream have expended $319,000 within the last five years for the construction of treatment facilities.

The discharge of potato pomace wastes along the Aroostook River was ordered stopped in 1959 by the Water Improvement Commission. Also, steps have been taken to abate pollution from municipal sources along this stream. The towns of Ashland, Presque Isle and Caribou have either constructed new facilities or modernized existing facilities, and the town of

Washburn has completed a preliminary study for pollution abatement. At Ft. Fairfield, final plans have been completed for abatement facilities. Within the last five years, expenditures for municipal treatment facilities along the Aroostook River have amounted to about $1,570,000. The State of Maine provides financial incentives for the construction of abatement facilities in the form of a grant-in-aid program amounting to 30 per cent of the construction cost determined to be eligible under P.L. 660.

BACKGROUND FOR RECOMMENDATIONS

Pertinent Basin Characteristics

The St. John River Basin is located in parts of Maine, New Brunswick and Quebec, and drains some 21,360 square miles. The economic development of the area centers around the basin's development of forests and agriculture. The production of potatoes and food processing related to potatoes as well as the production of pulp and paper and wood products are the basin's main industries.

Included in many interstate waters located within this basin are the St. John River, Aroostook River, Limestone Stream, Prestile Stream and the North and South Branches of the Meduxnekeag River. In addition, there are many interstate streams and rivers tributary to the St. John River which are essentially free of pollution. Because of the number of interstate rivers and streams and because of differences in characteristics, each will be discussed separately.

The largest river in the basin, the St. John River, flows some 365 miles, forming an arc across the northern part of Maine. Segments of the St. John River form portions of the boundary between the United States and Canada. The particular segment of the St. John River considered in this report is that reach extending from Little St. John Lake, the headwaters, to Grand Falls, New Brunswick, Canada--a distance of some 215 miles.

Storage in the St. John River within the United States is limited to a number of small dams in the headwaters used for controlling water for pulpwood drives. Even with these dams, flows are largely uncontrolled and average about 14,000 cfs at Van Buren, Maine. Future flow patterns on the St. John River may be altered by the construction of a large multi-purpose dam and reservoir at Dickey, Maine. Municipalities along the St. John River upstream of Grand Falls are relatively small and have a combined population of about 15,000. The industrialization of the river in this reach is limited to pulp and paper and the processing of potatoes for starch.

The Aroostook River, with headwaters in Millinocket and Munsungan Lakes in Maine, is one of the larger interstate streams tributary to the St. John River. This river flows some 110 miles, mostly in Maine, to join the St. John River in the parish of Aroostook, New Brunswick. The principal water storage in the St. John River Basin occurs in the headwaters of the Aroostook River or in waters tributary to the Aroostook. Two dams used for power production and two used to impound water for log driving control the flows to some extent. The average flow at Ft. Fairfield is about 4,200 cfs. Municipalities along the Aroostook River are generally larger than the communities along the St. John and have a combined population of about 29,000. Industrialization along the Aroostook River is generally limited to the potato processing industries.

Prestile Stream, one of the smaller streams tributary to the St. John River, nonetheless has water quality problems. This stream, with its headwaters near Easton, Maine, flows some twenty-five miles to enter the St. John River. The total drainage area of this stream in Maine is ninety-seven square miles and the natural, low, seven-day flow, occuring once in ten years, is 0.38 cfs at Easton, Maine, and 3.9 cfs near the U. S. -Canada border. A unique situation occurs inasmuch as waste water discharges by food processing activities at Easton range from about 7 to 15 cfs. The combined population of the towns along Prestile Stream is about 7,000 and industrialization is limited to the food processing plants mentioned above.

Limestone Stream rises north of Limestone, Maine, and flows some eight miles to the Canadian border where it enters the Aroostook River near Aroostook, New Brunswick. Although stream flow data is not available, the drainage area of seventy-six square miles in Maine indicates that flows may be on the same order as those at Prestile Stream. The only populated area along this stream in Maine is Limestone, which has a population of 3,500.

The two branches of the Meduxnekeag River each flow some twenty-five miles before crossing the Canadian border and combining into the Meduxnekeag River which joins the St. John River at Woodstock, New Brunswick. Stream flow data from a gaging station at Houlton, Maine, on the South Branch indicates that average flows of this branch are on the order of 244 cfs. The population of towns bordering either the north or south branches is about 10,300. Industrialization in these towns is limited to potato processing industries.

Present Water Quality

The present quality of the interstate rivers of the St. John River Basin, is shown in Figure II-2, and waste contributors affecting this quality are shown in Tables II-4 and II-5.

Water quality in the basin may be expected to vary because of the nature of the industries contributing wastes. Operation of starch plants and food processing plants are intermittent and are governed mainly by seasonal harvesting and also by opportune commodity market prices.

Pollution of the basin's interstate waters precludes or impairs the potential use of the rivers and their waters for many purposes, such as public water supplies (present water supplies could be endangered), propogation of fish, general recreation, and development as industrial supplies requiring a higher quality than that available.

The water quality as shown in Figure II-2 was determined after analyses of data contained in classification reports prepared by the Maine Water Improvement Commission. The present quality of the St. John River has been determined from data contained in the NENYIAC (New England-New York Inter-Agency Committee) report. For uniformity of presentation of both present and estimated future water quality, an attempt has been made to show the quality of the waters in relation to the New England Interstate Water Pollution Control Commission Standards of Water Quality dated September 14, 1966. These standards of quality are shown in Appendix A.

The present quality of the St. John River is shown in Figure II-2, and the waste contributors affecting this quality are shown in Table II-4. From the river's headwaters to Fort Kent, Maine, the St. John River and its interstate tributaries are free of major pollution sources. At Fort Kent, two potato starch plants and the town of Fort Kent contribute wastes having a BOD (population equivalent) of about 44,000. This waste contribution degrades the water from Class A upstream of Fort Kent to Class C below Fort Kent. The Class C quality is sustained down to Madawaska, Maine, by another starch plant at Frenchville, which discharges about 28,000 BOD (population equivalents). At Madawaska, Maine, and Edmunston, New Brunswick, wastes from the Fraser Paper Company, Ltd., with a combined BOD of about 1,100,000 P. E. (population equivalent) and municipal wastes significantly degrade the river to Class D. Although specific data on the degradation of various quality parameters is unavailable, the entrance of wastes with BOD requirements of this magnitude would lower the dissolved oxygen concentration. Furthermore, high solids from industrial wastes would promote the buildup of sludge deposits. This degraded water quality, sustained by starch plants in Grand Isle and Van Vuren, Maine, continues throughout the remaining reach of the St. John River in the United States.

The present quality of the Aroostook River is shown in Figure II-2, and the waste contributors affecting this quality are shown in Table II-5. Between the headwaters of the Aroostook and the town of Ashland, Maine, the river is relatively free of pollution sources and is at least Class B quality. From Ashland to Caribou, the river exhibits a fairly uniform cycle of degradation and recovery caused by the discharge of either municipal or industrial wastes or both. The river below Ashland, Washburn and Presque Isle is degraded to Class D but recovers for a short reach before being degraded again as wastes from downstream municipalities and industries enter the stream. Below Caribou, the river is degraded to Class D and remains such without recovery to the Canadian border. The present quality is caused by a number of starch plants and food processing plants. The total waste load contributed to this river is comparable to wastes from a population greater than 400,000; more than 80 per cent of this total is contributed by the starch and food processing plants. These wastes significantly deplete the dissolved oxygen concentration and cause the deposition of solids.

The present quality of Limestone Stream is shown in Figure II-2, and waste contributors affecting this quality are shown in Table II-5. From the stream's headwaters to Limestone, Maine, the quality of the water is fairly good. At Limestone, Maine, municipal and industrial wastes degrade the quality to Class D, which condition continues to the Canadian border. The major polluter of this stream is a single starch plant in Limestone, Maine, whose discharges reduce dissolved oxygen and deposit solids. The wastes contributed by the starch plant have a BOD (population equivalent) of about 12,000.

The present quality of Prestile Stream is shown in Figure II-2, and the waste contributors affecting this quality are shown in Table II-5. The quality of the stream is generally of nuisance quality at least to the Canadian border. This quality is caused by two food processing plants in Easton, Maine, which contribute wastes comparable to that from a population of between 164,000 and 234,000 people. Relatively minor waste loads are contributed by the municipality of Mars Hill, Maine. The introduced wastes degrade the quality by depleting the dissolved oxygen concentration and cause the deposition of solid matter.

The present quality of the North and South Branches of the Meduxnekeag River is shown in Figure II-2, and waste contributors affecting this quality are shown in Table II-5. From the headwaters to the first towns on the rivers' branches, the quality of the water is good. On the North

Branch, wastes from a potato starch plant at Monticello, Maine, degrade the quality to Class C which condition continues to the Canadian border. Although the actual waste loadings from this plant are unknown, they may be expected to be substantial. On the South Branch, municipal wastes from Hodgdon, Maine, degrade the quality to Class C, and at Houlton, Maine, the river is further degraded to Class D by municipal wastes and by wastes from a potato starch plant.

Table II-4

ST. JOHN RIVER BASIN

St. John River

Sources of Pollution

Source[1]	River Mile	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treatment	Waste Flow, Mgd.	Waste Load, P.E. of BOD
Fort Kent, Me. (M)	270	2,787	2,500	Municipal	None	Undet.	2,500
Starch Plant (I)			Undet.	Potato Starch	Pumice rem.	"	20,600
Starch Plant (I)			"	" "	" "	"	20,600
Fort Kent College (M)			"	Municipal	None	"	Undet.
Frenchville, Me.		1,421	None				
Starch Plant (I)			Undet.	Potato Starch	None	"	28,000
Madawaska, Me. (M)	257	5,507	3,800	Municipal	"	"	3,800
Fraser Paper Ltd. (I)			Undet.	Paper	"	"	50,000
Edmundston, N. B.	257	Undet.	"	Undet.	Undet.	Undet.	Undet.
Fraser Co., Ltd. (I)			"	Pulp	None	"	1,086,000
Grand Isle, Me.			None				
Grand Isle Starch Co. (I)			Undet.	Potato Starch	None	"	Undet.
Van Buren, Me. (M)	230	3,589	3,000	Municipal	"	"	3,000
Beaver Brook Starch Co. (I)			Undet.	Potato Starch	"	"	Undet.

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1. Parenthetical M and I following the listed waste source indicate municipal or industrial sources, respectively.

Table II-5

ST. JOHN RIVER BASIN

Interstate Tributaries
Aroostook and Meduxnekeag Rivers and Prestile and Limestone Streams

Sources of Pollution

Source[1]	River Mile	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treatment	Waste Flow, Mgd.	Waste Load, P.E. of BOD
Aroostook River							
Ashland, Me. (M)	Undet.	1,980	1,200	Municipal	Secondary	Undet.	Undet.
Washburn, Me. (M)	34	2,083	800	"	None	"	800
Taterstate Co. (I)			Undet.	Potato Proc.	Screening	"	45,300
A.E. Staley Mfg. Co. (I)			"	Potato Starch	Solids Rem.	"	35,800
Presque Isle, Me. (M)	34	12,886	8,000	Municipal	Primary	0.79	6,000
Presque Isle Starch Co. (I)			Undet.	Potato Starch	Solids Rem.	Undet.	15,900
Potato Services, Inc. (I)			Undet.	Potato Proc.	Prim.&Sec.	"	125,000
Caribou, Me. (M)	20	12,464	12,000	Municipal	Primary	1.35	48,200
Birds Eye (I)			Undet.	Potato Proc.	2	Undet.	153,000
Ft. Fairfield, Me.(M)	8	3,082	2,500	Municipal	None	"	2,500
Beaver Brook Starch Co. (I)			Undet.	Potato Starch	Pulp Rem.	"	9,800
A & P Co. (I)			"	Pot.&Pea Proc.	Primary	"	28,800
Meduxnekeag River (No. Br.)							
Monticello, Me.		1,109	None				
Powers Starch Co. (I)			Undet.	Potato Starch	Undet.	"	Undet.

Table II-5 (Continued)

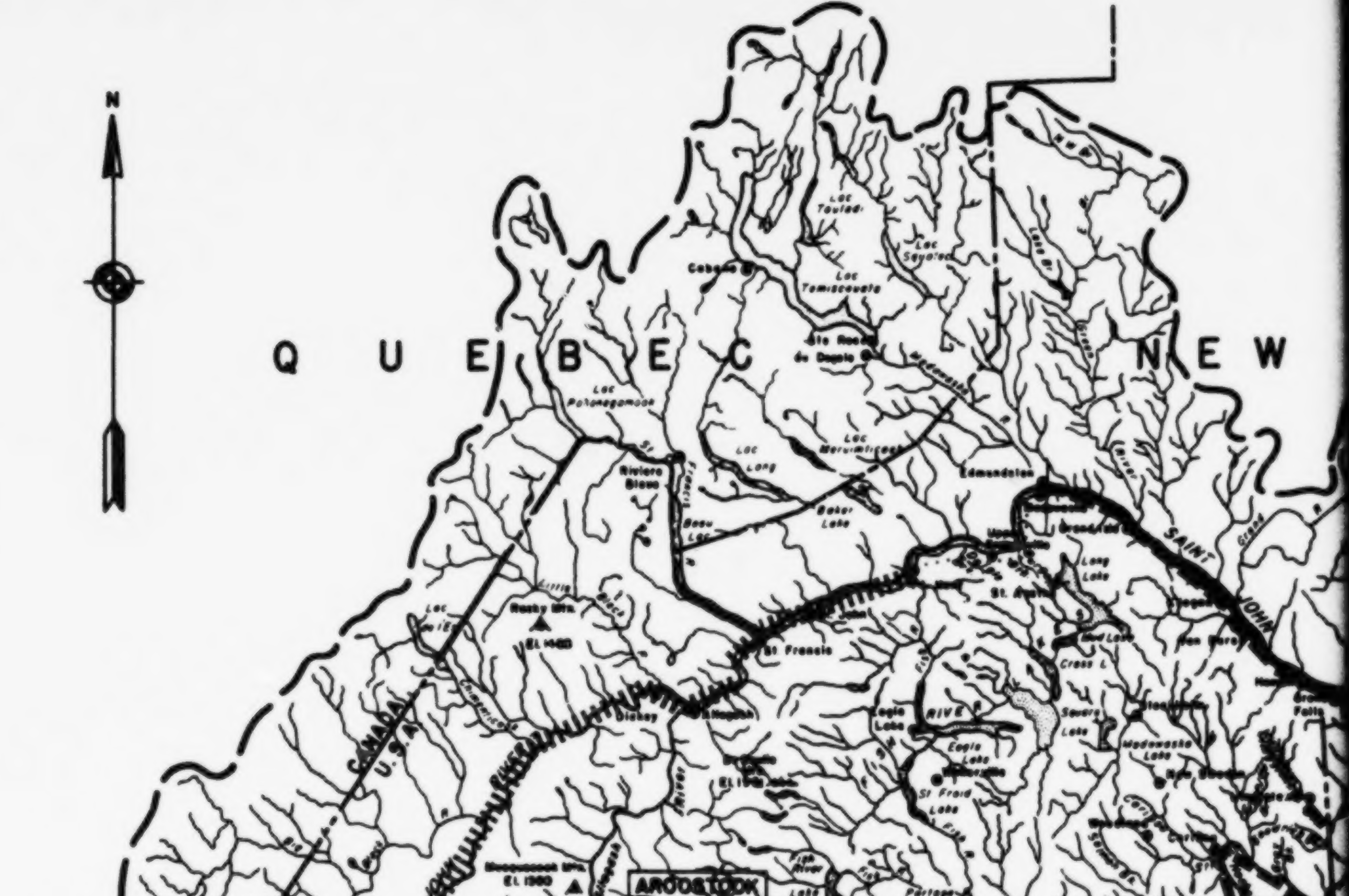
Source[1]	River Mile	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treatment	Waste Flow, Mgd.	Waste Load, P.E. of BOD
Meduxnekeag River (So. Br.)							
Hodgdon, Me.		926	None				
Hodgdon School (M)			250	Sanitary	Primary	Undet.	160
Houlton, Me. (M)	17	8,289	6,600	Municipal	None	"	6,600
Starch Factory (I)			Undet.	Potato Starch	Solids Rem.	"	50,000
Prestile Stream							
Easton, Me.		1,389	None				
Vahlsing Potato Proc. Plant (I)			Undet.	Potato Proc.	Primary[3]	1.7	94,000
Sugar Beet Refinery (I)			"	Sugar Beet	3	3.0-8.0	70 to 140,000
Mars Hill, Me. (M)	18	1,458	900	Municipal	Primary	Undet.	900
Limestone Stream							
Limestone, Me. (M)	5	3,500	2,050	Municipal	Prim.&Sec.	.164	140
Eastern Me. Starch Co. (I)			Undet.	Potato Starch	Solids Rem.	.09	11,700

1. Parenthetical M and I following the listed waste source indicate municipal or industrial sources, respectively.

2. Birds Eye's wastes are screened and put into the Caribou Municipal System; during the processing season, roughly two-thirds of the waste is by-passed directly to the river; P.E. shown is average load during by-pass.

3. Potato processing plant has ineffective primary system; sugar beet plant constructing facilities to remove solids and pulp which are considered inadequate by Maine Water Improvement Commission.

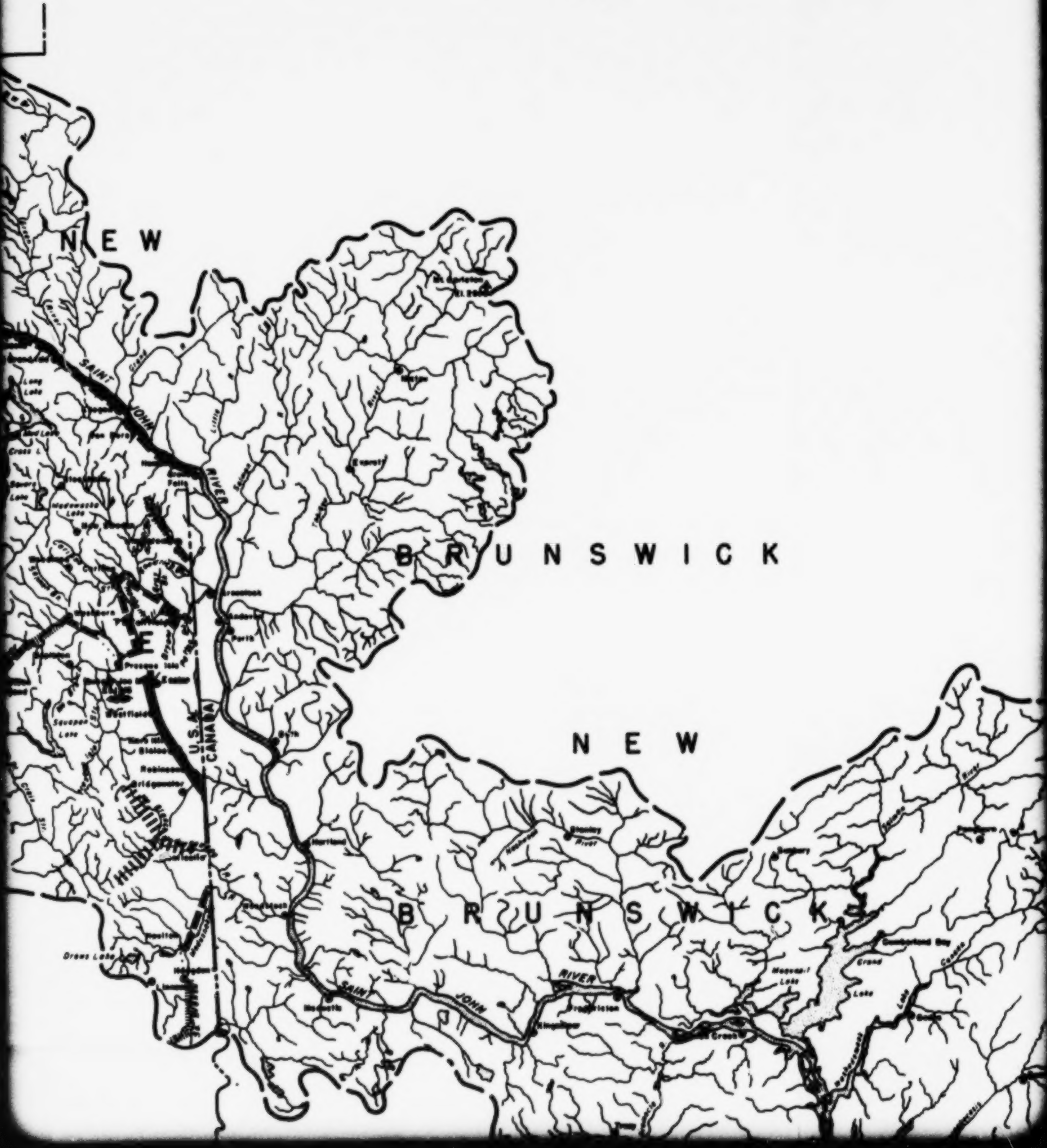
A


N
QUEBEC
NEW
M
A
I
N
E
CANADA
U.S.A.
SAINT
RIVER
SAINT JOHN
Lac Pohenegamook
Lac Touladi
Lac Temiscouata
Lac Long
Cabano
Riviere Bleue
Beau Lac
Baker Lake
Edmundston
St. Francis
Dickey
Allagash
Rocky Mtn. EL 1400
Eagle Lake
St Froid Lake
Fish River
Portage Lake
Square Lake
Cross L.
Long Lake
Madawaska Lake
Van Buren
Caribou
Presque Isle
Fort Fairfield
Washburn
Ashland
Westfield
Squapan Lake
Mars Hill
Blaine
Bridgewater
Houlton
Drews Lake
Horseback Mtn. EL 2000
Mooseleuk Lake
Munsungan Lake
Millinocket Lake
Millimagassett Lake
Churchill Lake
Eagle Lake
Chamberlain Lake
Allagash Lake
Umsaskis Lake
Long Lake
Chemquasabamticook Lake
Baker Lake
Little St John Lake
St Pamphile
Nine Mile Bridge
ST Croix Str.
AROOSTOOK CO.
SOMERSET CO.
PISCATAQUIS CO.
PENOBSCOT CO.
Chamberlain Lake Diversion
Telos Canal

LEGEND

SYMBOL	WATER QUALITY
IIIIIIIII	A

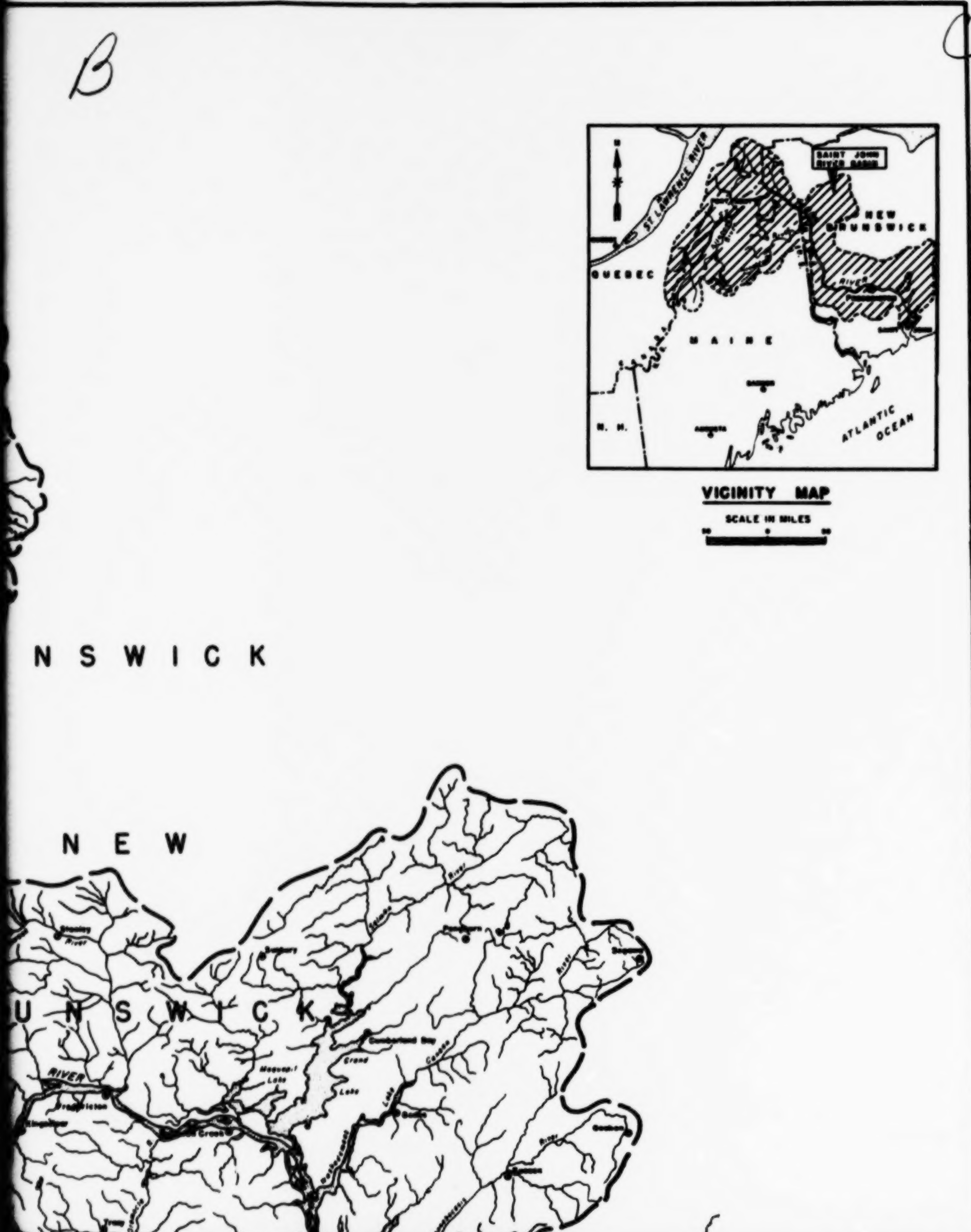
B



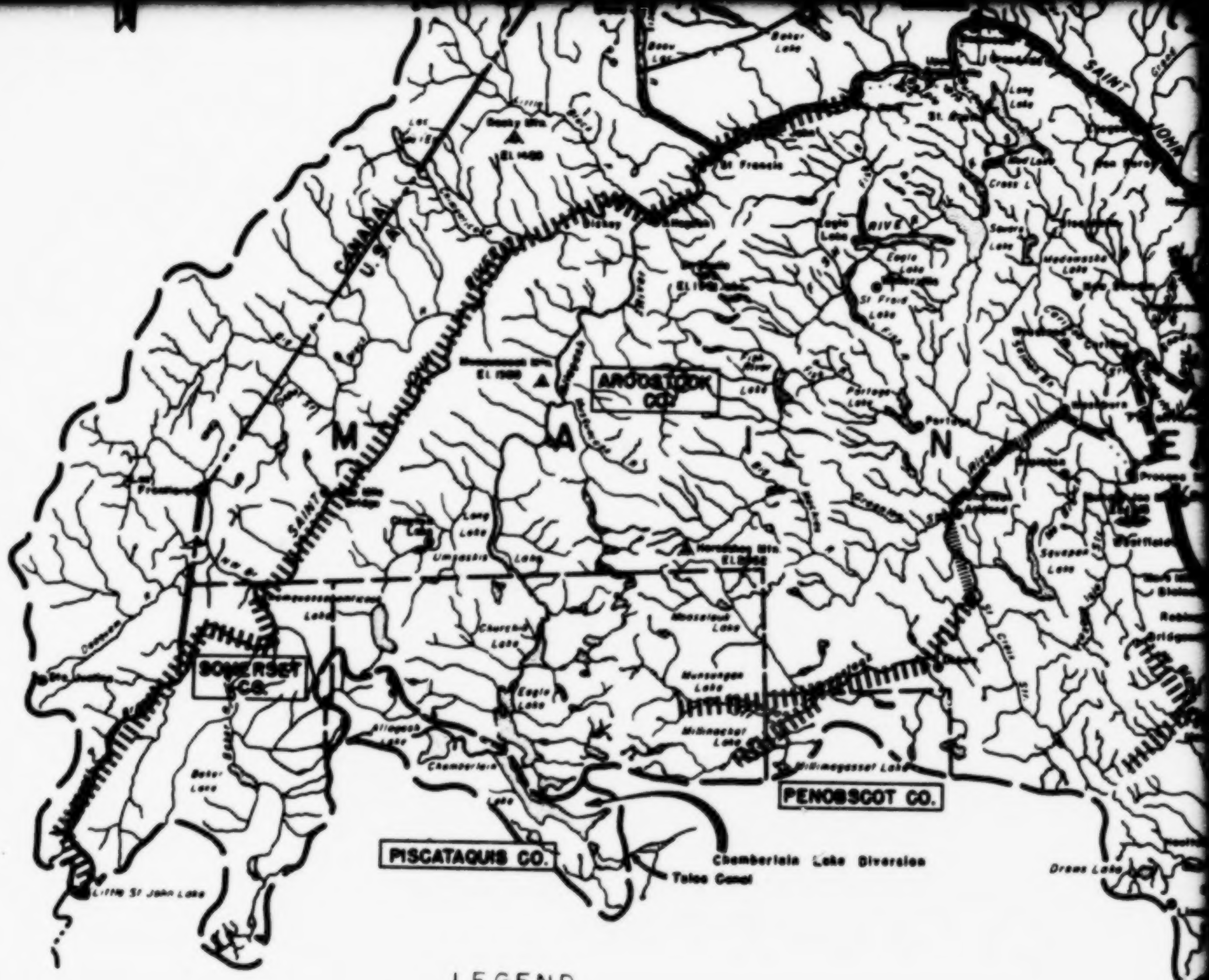
NEW
BRUNSWICK
NEW
BRUNSWICK
SAINT JOHN RIVER
SAINT JOHN RIVER
U.S.A.
CANADA
Long Lake
Cross L.
Square Lake
Madawaska Lake
Grand Falls
Perth
Bath
Presque Isle
Westfield
Squapan Lake
Robinson
Bridgewater
Hartland
Woodstock
Fredericton
Maquapit Lake
Cumberland Bay
Grand Lake
Canaan

B

C



SAINT JOHN RIVER BASIN
ST LAWRENCE RIVER
NEW BRUNSWICK
QUEBEC
MAINE
N. H.
ATLANTIC OCEAN
RIVER
VICINITY MAP
SCALE IN MILES
NSWICK
NEW
UNSWICK
RIVER
Fredericton
Maquapit Lake
Grand Lake
Cumberland Bay
Salmon River
Canaan River
Lake
Oromocto


CANADA
U.S.A.
SAINT JOHN
M
A
I
N
E
AROOSTOOK CO.
SOMERSET CO.
PENOBSCOT CO.
PISCATAQUIS CO.
St Francis
Long Lake
Umsaskis Lake
Churchill Lake
Eagle Lake
Allagash Lake
Chamberlain Lake
Munsungan Lake
Millinocket Lake
Millimagassett Lake
Portage Lake
Squapan Lake
Drews Lake
Baker Lake
Little St John Lake
Chamberlain Lake Diversion
Telos Canal

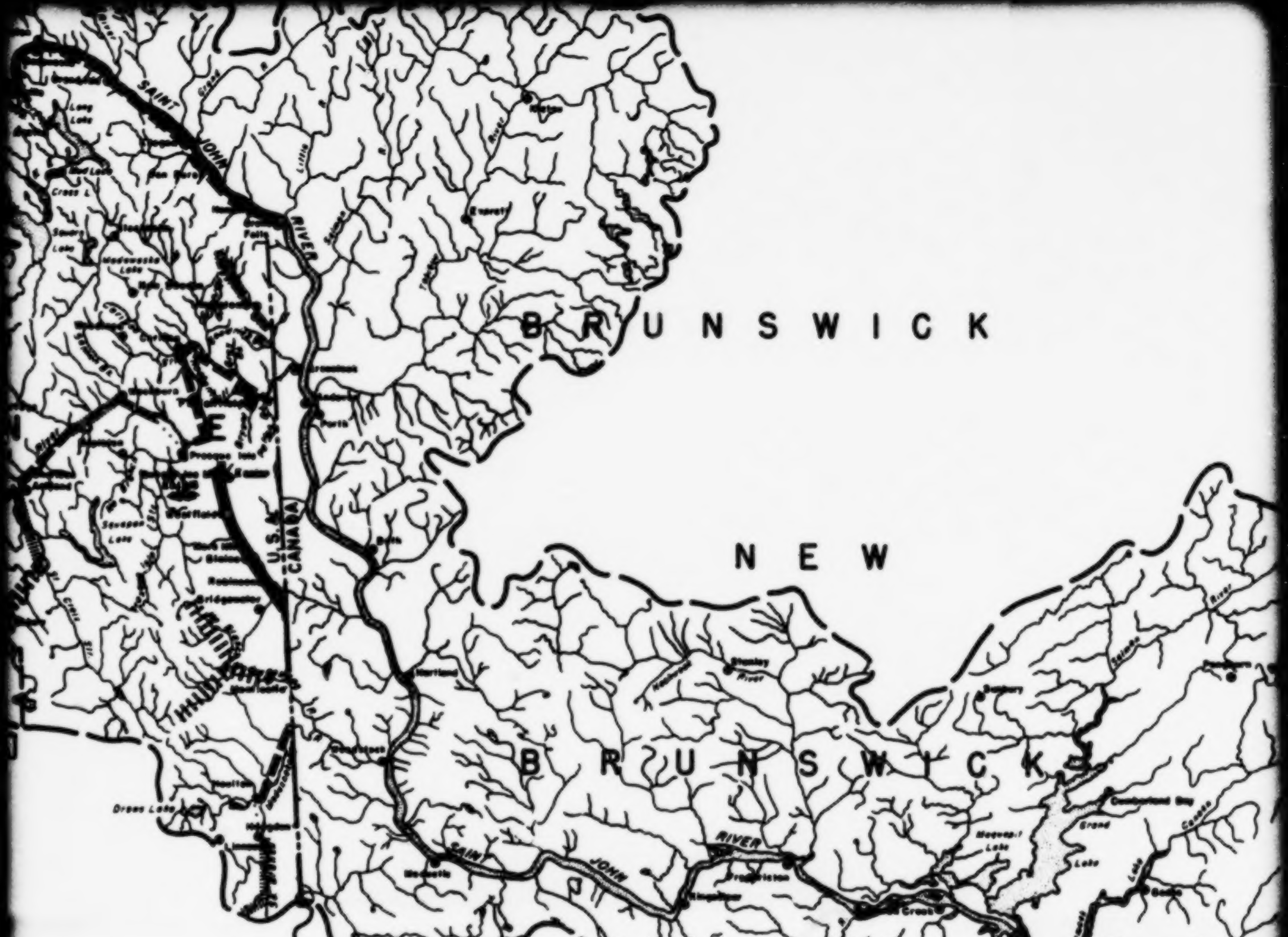
LEGEND

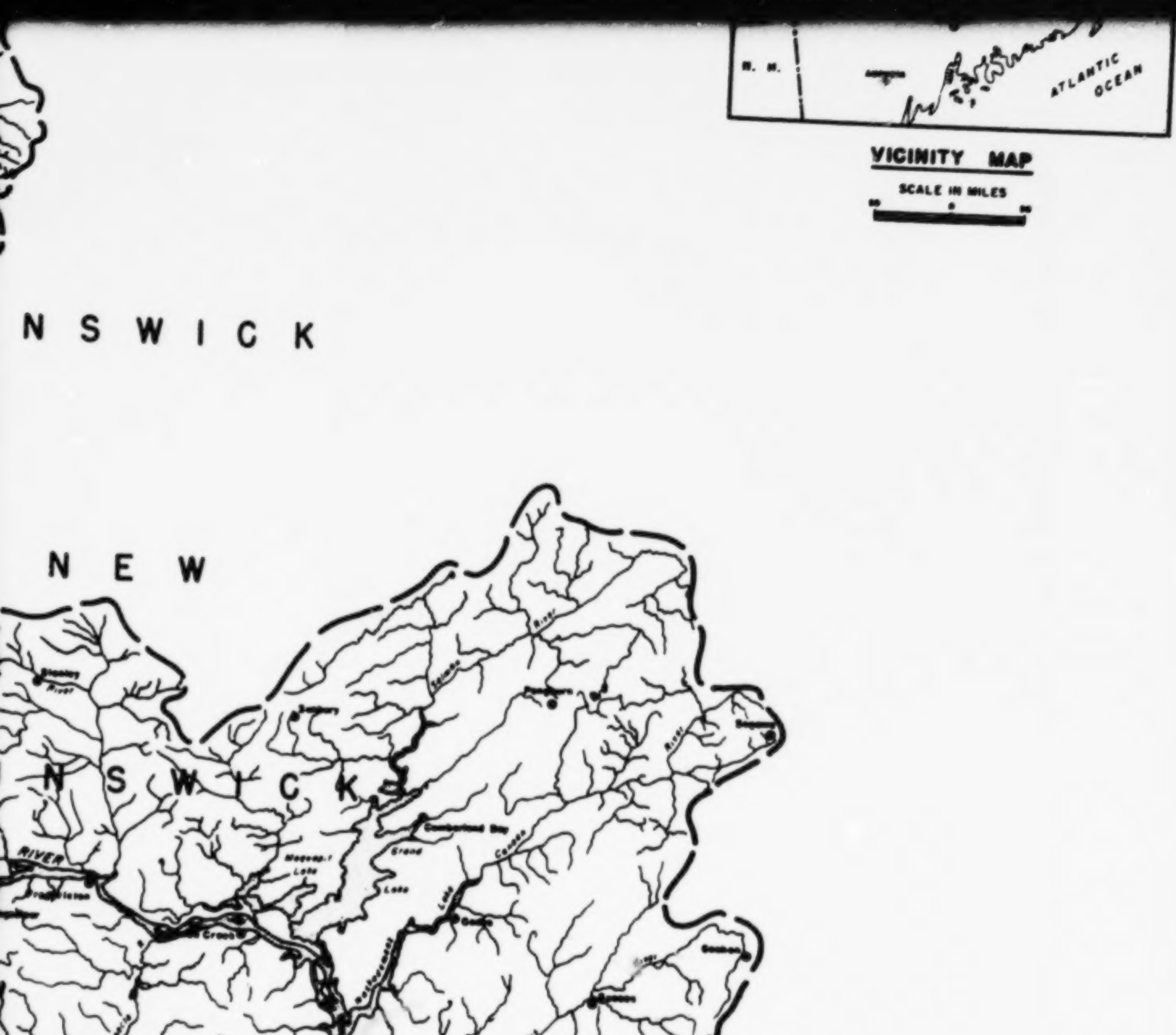
SYMBOL	WATER QUALITY
IIIIIIIII	A
‖‖‖‖‖‖‖‖	B
········	C
— — —	D
━━━━	Unsatisfactory

NOTES

1. Estimates of the present water quality are based upon the New England Interstate Water Pollution Control Commission Standards of Quality dated September 14, 1966
2. Conditions indicated are estimated to occur during periods of low stream flow

D


NEW
BRUNSWICK
NEW
BRUNSWICK
SAINT JOHN RIVER
SAINT JOHN RIVER
U.S.A.
CANADA
CANADA
U.S.A.
Grand Falls
Woodstock
Fredericton
Hampstead
Grand Lake
Oromocto Lake
Long Lake
Cross L.
Madawaska Lake
Squaw Lake
Drews Lake
Saint John Harbor
Passamaquoddy Bay
BAY
posed
ation
red


N. H.
ATLANTIC OCEAN
VICINITY MAP
SCALE IN MILES
NSWICK
NEW
NSWICK
RIVER
Grand Lake
Cumberland Bay
Long Reach
Saint John Harbor
BAY OF FUNDY
SCALE IN MILES

NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM

SAINT JOHN RIVER BASIN

PRESENT WATER QUALITY

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION BOSTON, MASS.

FIGURE II - 2

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CHAPTER III
ST. CROIX RIVER BASIN

SUMMARY

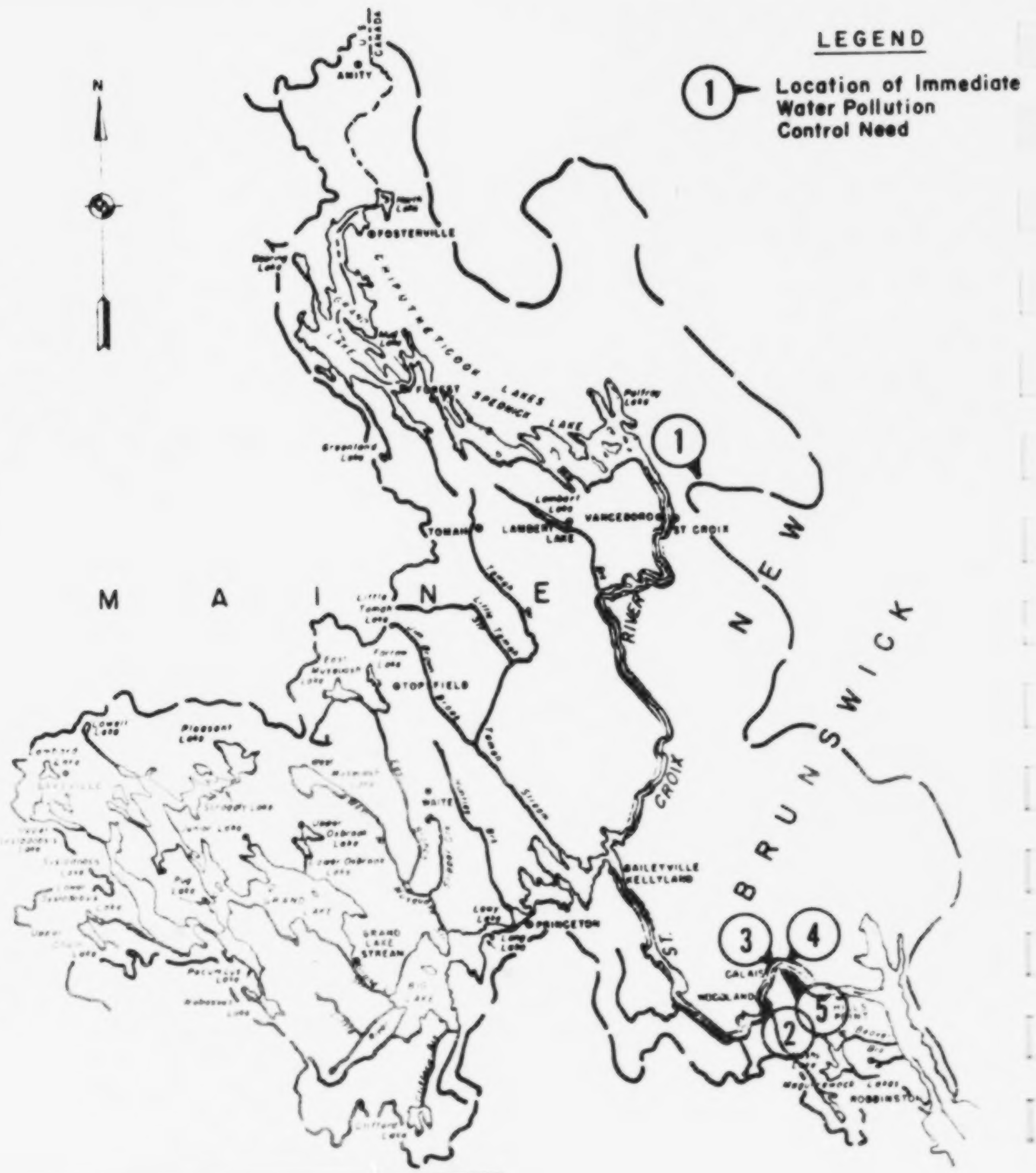
Major water quality problems of the interstate waters of the St. Croix River Basin occur along the St. Croix River from the village of Woodland, a part of the town of Baileyville, to below Calais, Maine. Untreated waste discharges from a paper company and several municipalities in both the United States and Canada result in severe water quality degradation in this reach.

The major industrial operation along this interstate stream is the manufacturing of paper at the St. Croix Paper Company. This industry, located at Woodland, contributes more than 95 per cent of the total BOD load discharged to the river. Although recent process changes at the plant will undoubtedly lower the total BOD load, this industry will still remain the major source of pollution.

Principal sources of municipal pollution are the towns of Baileyville and Calais, Maine, and the towns of Milltown and St. Stephens, New Brunswick. Although these towns contain over 90 per cent of the population contributing wastes to the river, their total waste contribution is only about 5 per cent of the total BOD load discharged.

Pollution control is required at the St. Croix Paper Company and at the sources of municipal wastes to achieve adequate levels of water quality. Pollution abatement is estimated to require a minimum expenditure of $5,000,000 by the towns and industries in Maine and New Brunswick discharging wastes directly to the St. Croix River. Evaluations of water quality problem areas indicate that immediate pollution control action should be directed toward the St. Croix Paper Company at Woodland, Maine.

Major industrial waste water discharges at this source have seriously degraded several miles of the river from Woodland to below Calais, Maine. Immediate water pollution control needs are summarized in Table III-1 and geographically pinpointed in Figure III-1. Although recommended priorities were chosen on the basis of relative importance in upgrading large reaches of the stream, these priorities are not intended to prevent or delay the initiation or completion of independent pollution control programs by municipalities or industries in either Maine or New Brunswick.


LEGEND
① Location of Immediate Water Pollution Control Need
N
U.S.
CANADA
AMITY
FOSTERVILLE
CHIPUTNETICOOK LAKES
SPEDNICK LAKE
FOREST
Grand Lake
Palfrey Lake
Greenland Lake
Lambert Lake
TOMAH
LAMBERT LAKE
VANCEBORO
ST CROIX
M A I N E
N E W B R U N S W I C K
RIVER
CROIX
ST.
Little Tomah Lake
East Musquash Lake
Farrow Lake
TOPSFIELD
Tomah Stream
Lowell Lake
Pleasant Lake
Upper Oxbrook Lake
Lower Oxbrook Lake
Pug Lake
WAITE
GRAND LAKE
GRAND LAKE STREAM
BIG LAKE
Clifford Lake
Pocumcus Lake
Long Lake
PRINCETON
BAILEYVILLE
WOODLAND
CALAIS
ROBBINSTON
1
2
3
4
5
SCALE IN MILES

NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM

ST. CROIX RIVER BASIN

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION BOSTON, MASS.

FIGURE III-1

Table III-1

ST. CROIX RIVER BASIN

St. Croix River

Summary of Immediate Water Pollution Control Needs

Location Map Key No.	Responsibility	Need	Priority[1]
2	St. Croix Paper Co., Baileyville (Woodland), Me., and the Town of Baileyville, Me.	Secondary Waste Treatment	A
5	Town of Calais, Me.	"	B
1	Town of McAdam, N. B.	"	C
3	Town of Milltown, N. B.	"	B
4	Town of St. Stephen, N. B.	"	A
-	International Joint Commission	Establish necessary liaison with State of Maine to aid in establishing water quality standards and implementing pollution abatement program for boundary waters of St. Croix River.	

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[1] Priorities of action are divided into three categories based on their impact on water quality improvements.

IMMEDIATE POLLUTION CONTROL NEEDS

The St. Croix Paper Company in Baileyville (Woodland), Maine, contributes greater than 95 per cent of the BOD discharged to the river. Because of the quantity of pollution from this industry, an immediate need exists for secondary waste treatment or its equivalent. With abatement accomplished, significant upgrading of this reach of the St. Croix below Woodland, Maine, will occur.

The wastes from the municipalities along the river contribute to the bacterial pollution of the stream below Woodland. Therefore, municipal wastes from both the U. S. and Canada should be treated by secondary or equivalent methods to upgrade the water quality.

Abatement of the pollution from Calais, Maine, will greatly diminish the significant portion of wastes contributed by sources in the United States. A similar need exists for control of pollution sources in Milltown and St. Stephen, New Brunswick. This report, therefore, recommends that these three sources should receive attention from appropriate agencies after the initiation of the pollution abatement program of the St. Croix Paper Company wastes. The pollution from other municipalities and villages in the United States and Canada constitute a small pollutional load to the St. Croix River and estuary.

COSTS

Estimates of costs for recommended pollution abatement measures have been based on provisions for secondary treatment, including disinfection, of all waste discharges. The estimates shown in Table III-2 were prepared by FWPCA utilizing costs obtained from consulting engineering and state classification reports, state agencies, and generalized treatment plant cost curves. These costs have been adjusted where necessary. These estimates serve only to indicate the order of magnitude of financial investment needed to abate pollution on the interstate streams of a basin and do not replace the more detailed estimates developed as a result of engineering studies for specific municipalities or industries. Pollution abatement facilities for sources discharging wastes to the interstate waters of the St. Croix River Basin will require a minimum expenditure of approximately $5,000,000.

Estimates for institutional practices recommended in the Summary section of this chapter have not been presented.

Table III-2

ST. CROIX RIVER BASIN

St. Croix River

Recommended Abatement Measures and Estimated Costs

Source[1]	Recommended Treatment	Estimated Cost[2]	Remarks
United States			
Baileyville, Me. (M & I)	Secondary	$2,500,000*	*Includes cost of treatment of wastes of St. Croix Paper Co.
Calais, Me. (M)	"	1,500,000	
Canada			
McAdam, N. B. (M)	Secondary	$ 181,000	
Milltown, N. B. (M)	"	210,000	
St. Stephen, N. B. (M)	"	320,000	
Total		$4,711,000	

1. Parenthetical M and I following the listed waste source indicate municipal or industrial sources, respectively.

2. Estimated costs for municipal waste sources include costs for waste treatment facilities and interceptors, where required.

RECENT PROGRESS IN POLLUTION CONTROL

The need for the abatement of pollution in the St. Croix River is recognized by both the St. Croix Paper Company and the bordering municipalities. Although the need is recognized by all of the municipalities, some are reluctant to assume the financial burden of abatement until such time as adequate treatment is provided for the wastes of the St. Croix Paper Company. The towns of St. Stephen and Milltown, New Brunswick, have completed preliminary plans for primary treatment and have indicated that they will meet their responsibilities when the above condition is met.

In response to a request from the International Joint Commission, the towns of Calais and Baileyville (Woodland), Maine, submitted schedules in 1966 to the IJC stating that planned construction would start in March 1967 and February 1968, respectively. The construction at Woodland will contain provisions for the treatment of wastes from the St. Croix Paper Company.

The St. Croix Paper Company has implemented certain plant changes resulting in a degree of pollution abatement. Among these changes are conversion to oil burners, which has eliminated the discharge of ash to the river, extension of operations to a seven day week, which has contributed to leveling streamflows, cessation of log drives, salvaging of pulpwood, and reduction of pulpwood inventory stored in the river.

The largest single plant change affecting the river was the conversion in 1966 from the sulfite to the Kraft process. Data taken during the period of changeover shows a marked improvement in the dissolved oxygen content of the river.

The St. Croix River, an international boundary water, is under the jurisdiction of the International Joint Commission. Although this commission has not promulgated water quality standards, the Advisory Board on Pollution Control recommended to the IJC certain water quality objectives for the St. Croix River. In general, the goal of these objectives is to attain a water whose quality is at least that of a Class C water when judged by the criteria of the New England Interstate Water Pollution Control Commission. Although these objectives, in effect, allow degradation below the present Class A of the reach of the St. Croix River above Woodland, Maine, data indicates that present pollution sources above Woodland do not degrade the river in this reach.

Although the IJC has jurisdiction over this waterway, and even though water quality objectives have been recommended, recent information indicates that the State of Maine will develop its own water quality standards for the St. Croix River.

The State of Maine provides funds in the amount of 30 per cent for grant-in-aid programs for pollution abatement. To date, communities in the United States have not expended any funds for construction of treatment facilities in the St. Croix River Basin.

BACKGROUND FOR RECOMMENDATIONS

Pertinent Basin Characteristics

The St. Croix River Basin, with headwaters in the Chiputneticook Lakes of Maine, is located in the northeastern portion of the State of Maine and the southwestern portion of the Province of New Brunswick, Canada. The River, which is the only interstate stream in the basin, forms a portion of the international boundary between the United States and Canada.

The St. Croix River drains some 625 square miles of Maine and 1,000 square miles of New Brunswick. It flows approximately seventy miles before discharging into Passamaquoddy Bay, and is subject to tidal action below Calais, Maine.

Flows in the St. Croix River are subjected to extensive control below Baileyville, Maine, by three hydroelectric installation whose operation is determined in large measure by the power and water requirements of the St. Croix Paper Company. These dams affect the water quality by lowering the stream velocities, decreasing reaeration, and permitting the creation of benthal deposits.

Prior to 1962, river flows were significantly reduced by weekend shutdown of the paper mill, at which time water was impounded for subsequent use. Since 1962, however, increased paper mill production and extended operations have resulted in a greater uniformity of flows throughout the week. Flows less than 1,000 cfs are predictable during periods of plant shutdown.

High organic loads introduced by industrial activities of pulp and paper mills at Woodland, Maine, seriously degrade the water quality prior to the river's passage through the more densely populated area. Over 85 per cent of the population along the St. Croix River is located downstream of Woodland, Maine.

Present Water Quality

The present quality of the St. Croix River is shown in Figure III-2, and waste contributors affecting this quality are shown in Table III-3. The quality shown was determined after analyses of data contained in reports prepared by the Advisory Board on Pollution Control of the International Joint Commission. This board has recommended certain water quality objectives for the St. Croix River. The water quality of the St. Croix River, as used in this report, and the objectives of the IJC have been referenced to the criteria of the New England Interstate Water Pollution Control Commission Standards of Water Quality dated September 14, 1966. These standards of quality are shown in Appendix A.

From its headwaters to about Woodland, Maine, the St. Croix River is free of major pollution sources and is Class A. At Woodland, the St. Croix Paper Company contributes over 95 per cent of the total BOD discharged to the St. Croix River. This waste, in addition to the municipal wastes of Woodland, significantly degrades the water quality for a reach extending downstream to Calais, Maine. Data collected in 1963 indicated that dissolved oxygen concentrations in excess of 6.7 mg/l existed at Vanceboro and occurred downstream as far as Woodland. At Woodland, the municipal and industrial wastes contributed to the depletion of dissolved oxygen to levels on the order of 2 mg/l and also contributed to bacterial pollution. Preliminary conclusions drawn from new data suggests that the recent conversion of the paper mill to the Kraft process may result in some improvement of the dissolved oxygen concentrations.

Sludge deposits in this reach of the river contribute to the depletion of oxygen. In 1963, the paper mills discharged total solids on the order of 210 tons daily. Data on suspended solids indicated that about 50 per cent of this quantity was deposited in the reach from Woodland to Calais.

The contributed wastes and existing benthal deposits degrade the river's water to Class D from about Woodland to Calais. Recovery of the stream from a dissolved oxygen viewpoint begins near Calais. This progressive improvement continues down to Passamaquoddy Bay.

Municipal wastes from Calais and Baileyville, Maine, and St. Stephen and Milltown, New Brunswick, contribute to the gross bacterial pollution in the estuary in the vicinity of Calais.

The pollution of the St. Croix and its estuary hampers the use of the river for recreational uses; furthermore, the poor aesthetic condition impairs the area's ability to attract tourists. Toxic pollutants have caused fish kills and the degree of bacterial pollution has resulted in the present embargo on the taking of shellfish in the estuary. The towns of Calais and Milltown are, at times, plagued by hydrogen sulfide odors eminating from the estuarine reach of the St. Croix River.

Table III-3

ST. CROIX RIVER BASIN

St. Croix River

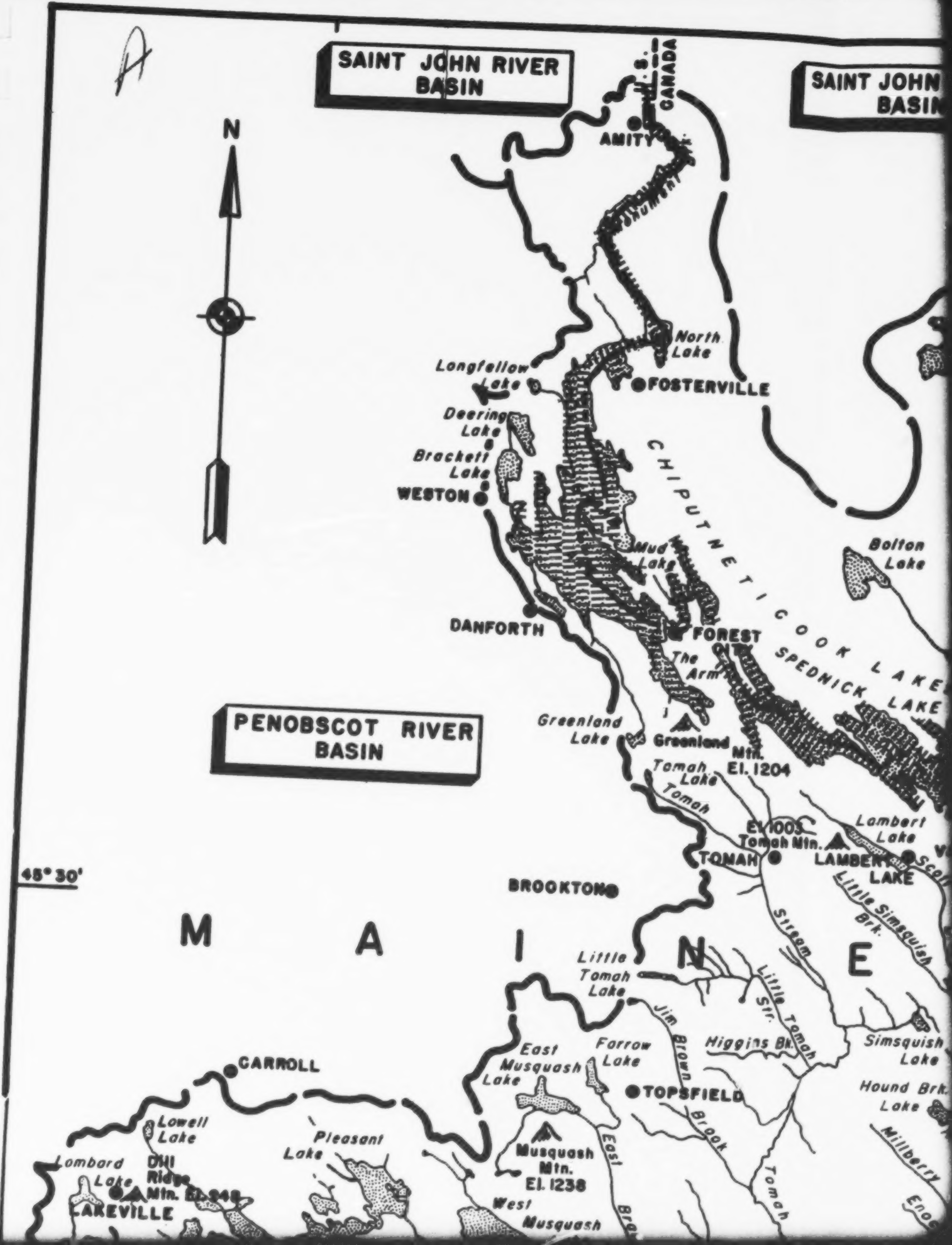
Sources of Pollution

Source[1]	River Mile	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treat.	Waste Flow, Mgd.	Waste Load, P.E. of BOD
United States							
Baileyville, Me. (M)	23	1,863	1,500	Municipal	None	Undet.	1,500
Woodland, Me. St. Croix Paper Co. (I)		Undet.	Undet.	Pulp & Paper	Lagoon	"	2
Calais, Me. (M)	16	4,223	3,800	Municipal	None	"	3,800
Canada							
McAdam, N. B. (M)	Undet.	2,570	800	Domestic	Primary	"	800
Milltown, N. B. (M)	"	1,870	1,600	Municipal	None	"	1,600
St. Stephens, N. B. (M)	16	3,260	3,000	Domestic	None	"	3,000

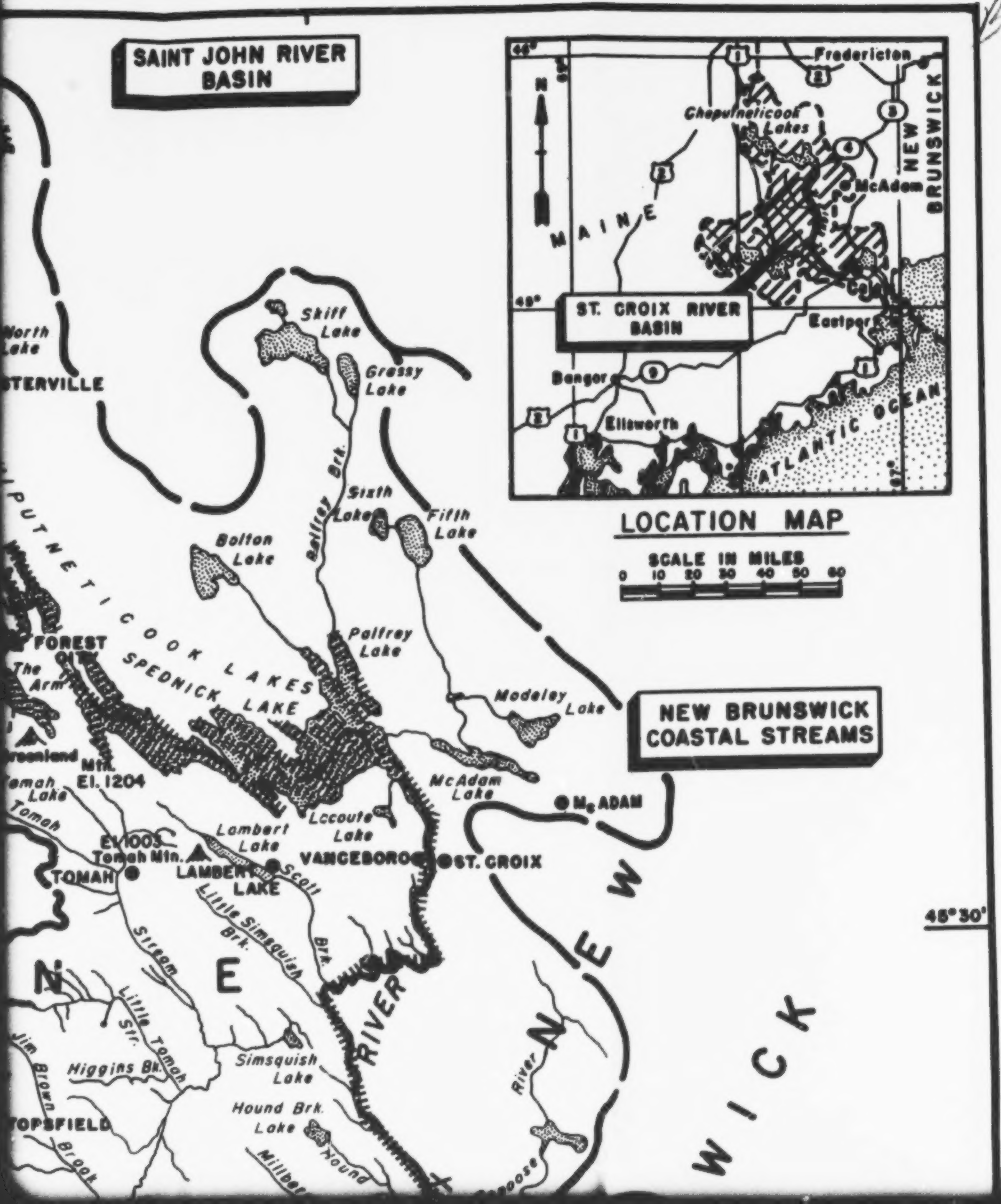
1. Parenthetical M and I following the listed waste source indicate municipal or industrial sources, respectively.

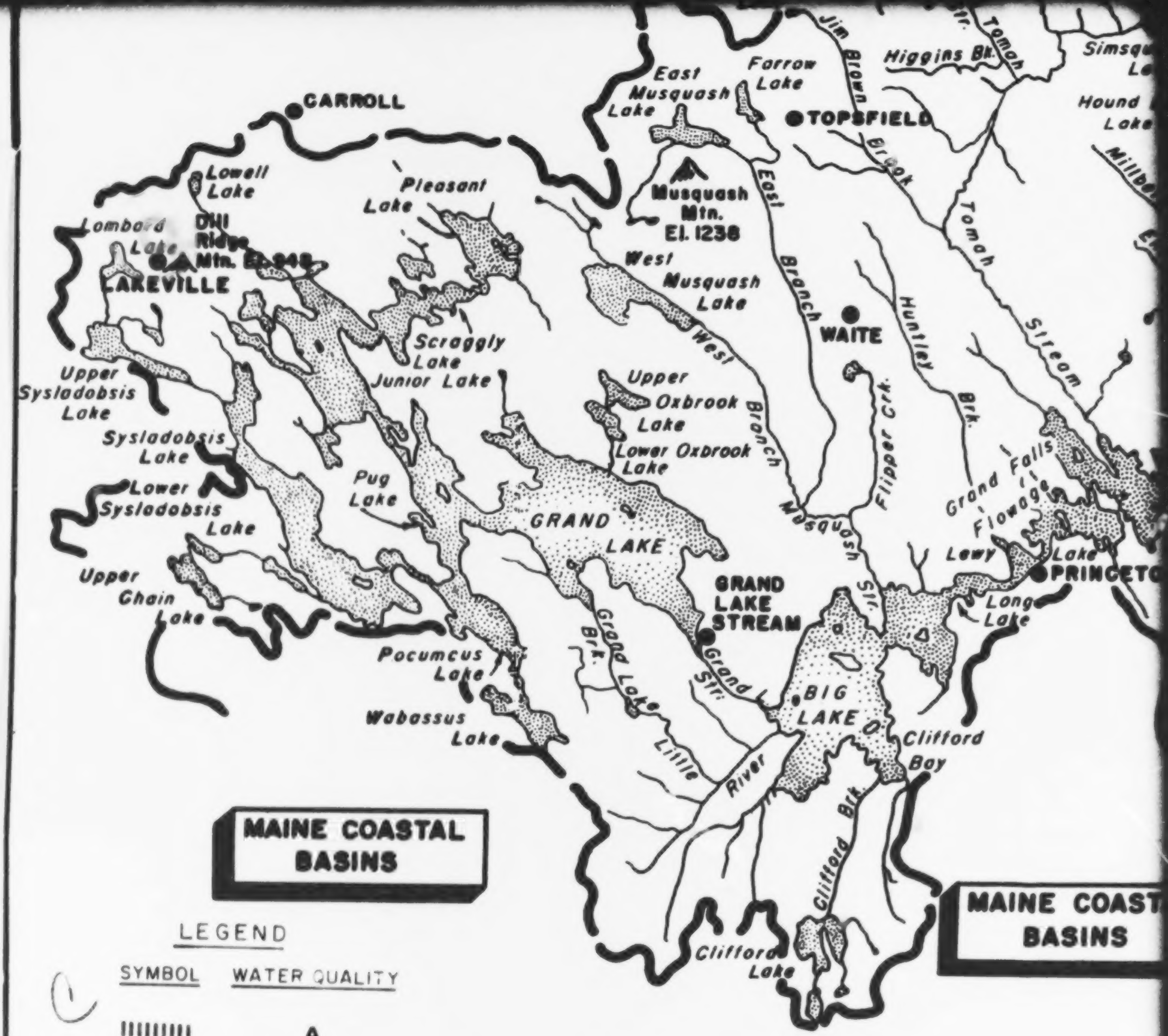
2. Plant has recently changed to a Kraft process. Prior to process change, waste load was 540,000 P. E. of BOD.

A


SAINT JOHN RIVER BASIN
SAINT JOHN
BASIN
U.S.
CANADA
N
AMITY
North Lake
Longfellow Lake
FOSTERVILLE
Deering Lake
Brackett Lake
WESTON
CHIPUTNETICOOK LAKES
Mud Lake
Bolton Lake
DANFORTH
FOREST CITY
The Arm
SPEDNICK LAKE
PENOBSCOT RIVER BASIN
Greenland Lake
Greenland Mtn. El. 1204
Tomah Lake
Tomah
El. 1003 Tomah Mtn.
Lambert Lake
TOMAH
LAMBERT LAKE
Scott
Little Simsquish Brk.
45° 30'
BROOKTON
Stream
M A I N E
Little Tomah Lake
Little Tomah Str.
Jim Brown Brook
Higgins Bk.
Simsquish Lake
East Musquash Lake
Farrow Lake
CARROLL
TOPSFIELD
Hound Brk. Lake
Millberry
Lowell Lake
Pleasant Lake
East Brook
Tomah
Lombard Lake
Dill Ridge Mtn. El. 948
LAKEVILLE
Musquash Mtn. El. 1238
West Musquash
Enoch

B


SAINT JOHN RIVER BASIN
NEW BRUNSWICK COASTAL STREAMS
LOCATION MAP
SCALE IN MILES
0 10 20 30 40 50 60
ST. CROIX RIVER BASIN
MAINE
NEW BRUNSWICK
ATLANTIC OCEAN
Fredericton
Chepulneticook Lakes
McAdam
Eastport
Bangor
Ellsworth
N
1
2
3
4
9
45°
68°
67°
North Lake
STERVILLE
Skiff Lake
Grassy Lake
Palfrey Brk.
Sixth Lake
Fifth Lake
Bolton Lake
PUTNETICOOK LAKES
SPEDNICK LAKE
FOREST CITY
The Arm
Palfrey Lake
Modeley Lake
McAdam Lake
McADAM
Greenland Mtn. El. 1204
Tomah Lake
Tomah
El. 1003
Tomah Mtn.
TOMAH
Lambert Lake
LAMBERT LAKE
Lacoute Lake
Scott
VANCEBORO
ST. CROIX
Little Simsquish Brk.
Brk.
Stream
RIVER
Little Tomah Str.
Higgins Bk.
Jim Brown Brook
TOPSFIELD
Simsquish Lake
Hound Brk. Lake
Hound
Millbel
River
oose
45°30'
NEW BRUNSWICK
MAINE


CARROLL
Lowell Lake
Lombard Lake
Dill Ridge Mtn. El. 948
LAKEVILLE
Pleasant Lake
East Musquash Lake
Farrow Lake
Jim Brown Brook
Tomah
Higgins Bk.
Simsquish Lake
Hound Lake
Millbrook
TOPSFIELD
Musquash Mtn. El. 1238
West Musquash Lake
East Branch
WAITE
Huntley Brk.
Tomah Stream
Scraggly Lake
Junior Lake
Upper Sysladobsis Lake
Sysladobsis Lake
Lower Sysladobsis Lake
Upper Oxbrook Lake
Lower Oxbrook Lake
West Branch
Flipper Crk.
Pug Lake
GRAND LAKE
Musquash Str.
Grand Falls Flowage
Lewy Lake
PRINCETON
Long Lake
Upper Chain Lake
GRAND LAKE STREAM
Grand Lake Str.
Grand Lake Brk.
Pocumcus Lake
Wabassus Lake
BIG LAKE
Clifford Bay
Little River
Clifford Brk.
Clifford Lake
MAINE COASTAL BASINS
MAINE COASTAL BASINS

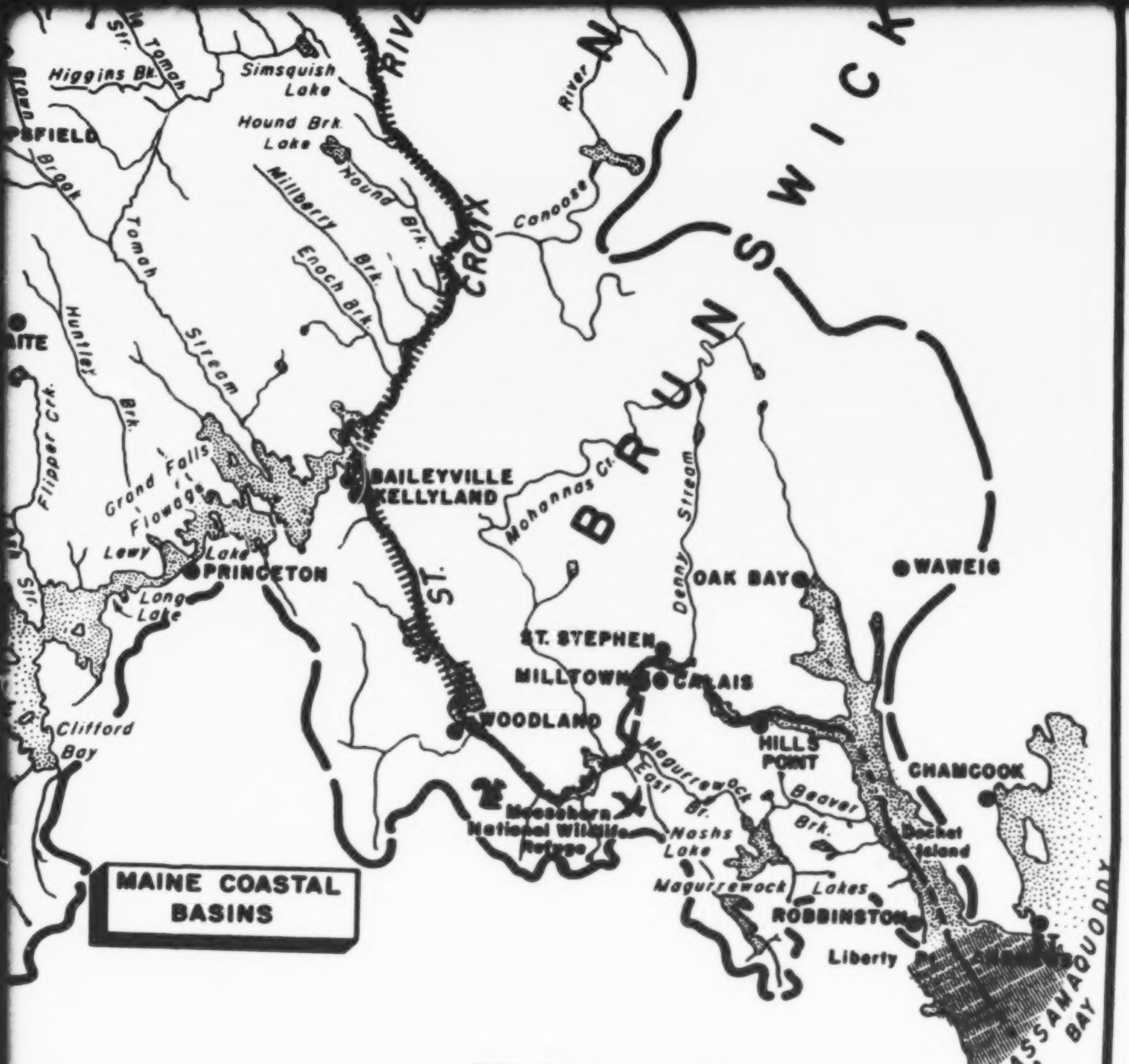
(1)

LEGEND

SYMBOL	WATER QUALITY
|||||||||	A
┆┆┆┆┆┆┆┆┆	B
┈┈┈┈┈	C
━ ━ ━	D
━━━━	Unsatisfactory

NOTES

1. Estimates of the present water quality are based upon the New England Interstate Water Pollution Control Commission Standards of Quality dated September 14, 1966
2. Conditions indicated are estimated to occur during periods of low stream flow


Higgins Bk.
Tomah
Str.
Simsquish Lake
Hound Brk. Lake
Hound Brk.
Millberry Brk.
Enoch Brk.
Brook
Tomah Stream
Huntley Brk.
Flipper Crk.
RIVER
CROIX
ST.
River
Canoose
NEW BRUNSWICK
Grand Falls Flowage
Lewy Lake
Long Lake
PRINCETON
BAILEYVILLE
KELLYLAND
Mohannas Cr.
Denny Stream
OAK BAY
WAWEIG
ST. STEPHEN
MILLTOWN
CALAIS
WOODLAND
HILLS POINT
Magurrewock
East Br.
Beaver Brk.
Moosehorn National Wildlife Refuge
Nashs Lake
Magurrewock Lakes
CHAMCOOK
Dochet Island
ROBBINSTON
Liberty
Clifford Bay
PASSAMAQUODDY BAY
MAINE COASTAL BASINS

NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM

ST. CROIX RIVER BASIN

PRESENT WATER QUALITY

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION
BOSTON, MASS.

D

nt water quality are based
Interstate Water Pollution
ndards of Quality dated

estimated to occur
tream flow

SCALE IN MILES
0 4 8

FIGURE III-2

F

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CHAPTER IV

NORTH MAINE COASTAL BASIN

SUMMARY

Major water quality problems exist in certain areas of the North Maine Coastal Basin. In general, the most extensive problems exist near large municipalities where relatively large rivers enter the coastal waters, and in small bay areas. The problems are caused by treated, inadequately treated, or untreated wastes from municipalities, industries and individual polluters. Except in the estuarine portions of the coastal waters and other limited areas, the pollution problems arise from the presence of coliform organisms in numbers sufficient to preclude or impair shellfishing and recreational use. In the estuarine reaches of the larger rivers, contributed wastes significantly lower the dissolved oxygen concentration and cause the deposition of solids, in addition to bacterial pollution.

Industrial operations along the Maine coast generally consist of paper, food and fish processing, and metal fabricating industries. Of the total determined BOD load discharged to the coastal waters, more than 90 per cent is contributed by industrial discharges which are the chief causes of the degraded water quality existing in the estuaries of the Kennebec and Penobscot Rivers. Augusta and Bangor, Maine, and many smaller towns contribute relatively small pollutional loads to their adjoining estuaries.

Evaluation of water quality data for the tidal portions of the Kennebec and Penobscot Rivers indicates that significant reaches of these estuaries are of nuisance quality. Along the Penobscot River estuary, the nuisance conditions at times improve since they are affected by the tide and river flows.

The degraded conditions in the Kennebec River Estuary is maintained by the discharge of significant waste loads to the intrastate portion of the river above Augusta and by the direct discharge to the coastal waters below Augusta of wastes of Hudson Pulp and Paper Co. at Augusta and by the S. D. Warren and Gardner Paper Co. at Gardner. The City of Augusta contributes to the quality degradation by the discharge of bacterial pollutants.

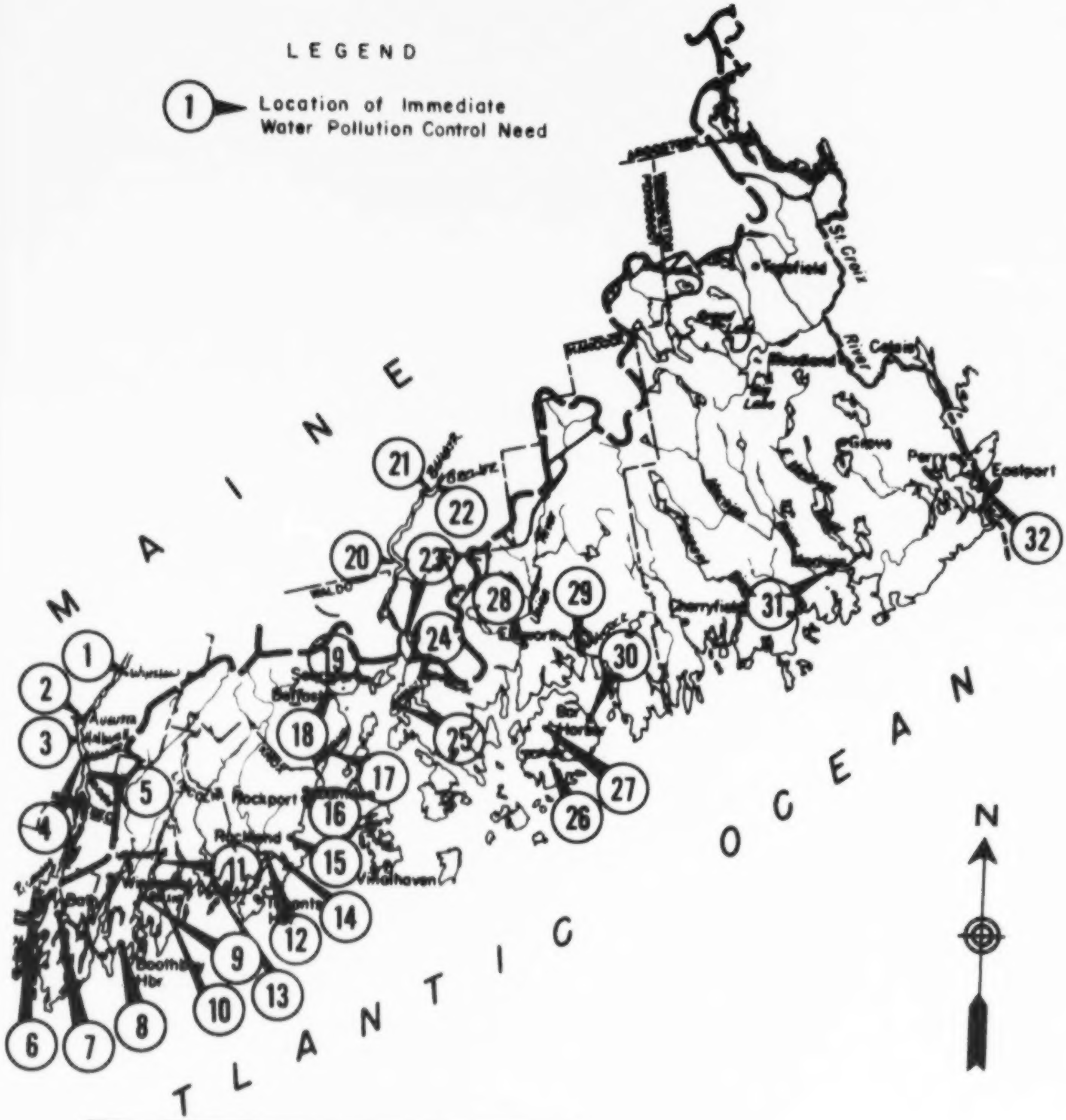
The most significant polluters along the Penobscot River estuary are the industrial operations of the Standard Packaging Corporation at Brewer, Maine, and the St. Regis Paper Company at Bucksport, Maine. These two industries account for more than 95 per cent of the BOD load contributed to the estuary. Also, municipal wastes from the Bangor-Brewer area contribute a significant portion of the bacterial pollution.

The water quality is degraded to some degree at many other locations along the coast. This degradation is caused primarily by municipal, domestic and industrial wastes from a large number of individual outfalls. In these areas, the water quality is generally impaired by bacterial pollution.

The nuisance conditions existing in the Kennebec and Penobscot estuaries dictate that immediate control programs should be directed toward polluters in these areas. Because of pollution entering the estuaries from the intrastate portions of these streams, abatement of pollutants discharged directly into the estuary may not be sufficient to upgrade the water quality and, therefore, abatement of the major sources of pollution to the intrastate portion of these streams will be necessary to achieve improved water quality levels.

Pollution abatement facilities for sources along the Kennebec and Penobscot estuaries will require an estimated minimum expenditure of $48,000,000 by the cities, towns and industries involved. Pollution abatement facilities for other sources of municipal and industrial waste to the coast proper will require an estimated minimum expenditure of $18,000,000.

Immediate water pollution control needs are summarized in Table IV-1, and are pinpointed on the accompanying map, Figure IV-1.


LEGEND
1
Location of Immediate Water Pollution Control Need
MAINE
ATLANTIC OCEAN
N
St. Croix
River
Topsfield
Calais
Perry
Eastport
Cherryfield
Ellsworth
Bar Harbor
Belfast
Rockport
Rockland
Vinalhaven
Boothbay Hbr
Augusta
Hallowell
Bucksport
Waldo
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
SCALE IN MILES
10
5
0
10

NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM

NORTH MAINE COASTAL BASIN

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION BOSTON, MASS.

FIGURE IV-1

Table IV-1

NORTH MAINE COASTAL BASIN

Coastal Waters

Summary of Immediate Water Pollution Control Needs

Location Map Key No.	Responsibility	Need	Priority[1]
1	Scott Paper Co., Winslow, Me.	Secondary Waste Treatment	A
2	City of Augusta, Me.	"	A
2	Hudson Pulp & Paper Co., Augusta, Me.	"	A
7	City of Bath, Me., incl. Canning Plant, Shipyard, & Metal Products Plant	"	A
21	City of Bangor, Me.	"	A
22	Standard Packaging Corp., Brewer, Me.	"	A
23	St. Regis Paper Co., Bucksport, Me.	"	A
30	Town of Bar Harbor, Me.	"	A
2	Bates Mfg. Co., Augusta, Me.	"	B
3	Town of Hallowell, Me.	"	B
4	Town of Gardiner, Me.	"	B
4	Gardiner Paper Co. & S. D. Warren Co., Gardiner, Me.	"	B
5	Town of Randolph, Me.	"	B
18	City of Belfast, Me.	"	B

Table IV-1 (Continued)

Location Map Key No.	Responsibility	Need	Priority[1]
18	Belfast Canning Co., Maplewood Packing Co. & Penobscot Poultry Co., Belfast, Me.	Secondary Waste Treatment	B
22	City of Brewer, Me.	"	B
22	S. A. Maxfield, Brewer, Me.	"	B
32	City of Eastport, Me.	"	B
28	City of Ellsworth, Me.	"	B
6	Town of Richmond, Me.	"	C
3	Town of Farmingdale, Me.	"	C
8	Town of Boothbay Harbor, Me.	"	C
9	Town of Bristol, Me.	"	C
10	Town of Damariscotta, Me.	"	C
11	Town of Newcastle, Me.	"	C
12	Town of Waldoboro, Me.	"	C
13	Town of Friendship, Me.	"	C
14	Town of Thomaston, Me.	"	C
14	State Prison, Thomaston, Me.	"	C
15	Town of Rockland, Me.	"	C
16	Town of Camden, Me.	"	C
17	Town of North Haven, Me.	"	C
18	Sherman & Co., Belfast, Me.	"	C

Table IV-1 (Continued)

Location Map Key No.	Responsibility	Need	Priority[1]
19	Town of Searsport, Me.	Secondary Waste Treatment	C
19	Northern Chemicals Industries, Searsport, Me.	"	C
20	Town of Winterport, Me.	"	C
20	Town of Frankfort, Me.	"	C
19	Town of Stockton Springs, Me.	"	C
23	Town of Bucksport, Me.	"	C
18	Town of Northport, Me.	"	C
31	Town of Machias, Me.	"	C
25	Town of Castine, Me.	"	C
25	Maine Maritime Academy, Castine, Me.	"	C
24	Penobscot Canning Company Penobscot, Me.	"	C
29	Town of Hancock, Me.	"	C
29	Hancock-Ellsworth Tanneries, Hancock, Me.	"	C
26	William Underwood Co., Tremont, Me.	"	C
27	Mt. Desert, Me.	"	C
--	State of Maine and affected municipality	Proceed to undertake inventory of domestic & industrial wastes discharged through individual outlets & undertake planning programs to abate pollution from these sources.	A

---

1. Priorities of actions are divided into 3 categories based on their impact on water quality improvements.

IMMEDIATE POLLUTION CONTROL NEEDS

The water quality of the coastal waters of Maine is degraded in many areas to some extent. This degradation is sufficient to create nuisance conditions in the estuaries of the Kennebec and Penobscot Rivers.

Since a large proportion of the total waste load is contributed by industrial activities, immediate pollution abatement measures should be directed toward these sources. In view of the magnitude of the industrial pollution loads, sufficient abatement can be accomplished only by providing secondary treatment.

The water of the Kennebec River estuary from Augusta to about Merrymeeting Bay is presently nuisance quality. From Merrymeeting Bay to the vicinity of Bath, the water is degraded to Class D[1]; this degraded quality may possibly continue much further southward along the estuary. The nuisance conditions and degraded quality are caused primarily by industrial activities of the Hudson Paper Company in Augusta and the S. D. Warren and Gardener Paper Companies in Gardener and by the municipal wastes of Augusta. The Scott Paper Company in Winslow, Maine, discharges significant quantities of waste into the intrastate portion of the Kennebec. Although the scope of this report is generally limited to the interstate waters, the effects of the Scott Paper Company wastes on the quality of the interstate waters indicates that this source should be considered as a target for immediate action.

Conditions similar to those on the Kennebec estuary also exist in the Penobscot estuary. During low stream flows, the quality of the water in the estuary creates nuisance conditions from Bangor to about Bucksport. This degraded condition is primarily the result of wastes discharged by the Standard Packaging Corporation in Brewer and the St. Regis Paper Company in Bucksport, Maine. Combined, these two companies account for about 95 per cent of the total waste load discharged to the estuary below Bangor. Additional significant waste discharges come from the S. A. Maxwell Corporation and Bangor and Brewer.

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[1] Based on New England Interstate Water Pollution Control Commission Water Quality Standards shown in Appendix A.

Abatement of these sources of pollution to the Kennebec and Penobscot estuaries will significantly reduce the nuisance conditions in both estuaries and the coastal waters proper.

Limited areas of the coast are also significantly degraded. These areas are primarily the estuaries of smaller coastal streams and the waters adjoining relatively large towns. The bay areas in the vicinity of Belfast, Ellsworth, Bar Harbor and Eastport are degraded to Class D and, at times, the water quality in the vicinity of Bar Harbor creates nuisance conditions. Poor water quality is caused chiefly by the discharged wastes of several municipalities, except at Belfast where the Belfast Canning Company, Maplewood Packing Company and the Penobscot Poultry Company, with a combined BOD waste load of 41,600 population equivalents, contribute significantly to the degraded water quality. The waters in the vicinity of Belfast have been aesthetically degraded in the past by floating solids--namely, feathers and chicken entrails.

Although the water quality of these areas is significantly degraded, pollution abatement at Belfast, Ellsworth and Eastport may be accomplished after first abating the major pollutional sources in the Kennebec and

Penobscot River estuaries.

The remaining sources of pollution, although contributing to the water quality, do not degrade the water below Class C. Abatement of these sources of pollution are recommended after abatement of other sources.

COSTS

Estimates of costs for recommended pollution abatement measures have been based on provisions for secondary treatment, including disinfection, of all waste discharges. The estimates shown in Table IV-2 were prepared by FWPCA utilizing costs obtained from consulting engineering and state classification reports, state agencies, and generalized treatment plant cost curves. These costs have been adjusted where necessary. These estimates serve only to indicate the order of magnitude of financial investment needed to abate pollution on the interstate streams of a basin and do not replace the more detailed estimates developed as a result of engineering studies for specific municipalities or industries. Pollution abatement facilities for sources discharging wastes to the interstate waters of the North Maine Coastal Basin will require a minimum expenditure of approximately $65,000,000.

Estimates for institutional practices recommended in the SUMMARY section of this chapter have not been presented.

Table IV-2

NORTH MAINE COASTAL BASIN

Coastal Waters

Recommended Abatement Measures and Estimated Costs

Source[1]	Recommended Treatment	Estimated Cost[2]	Remarks
Winslow, Me.			
Scott Paper Co.	Secondary	$10,000,000	
Augusta, Me. (M)	"	947,000	
Hudson Pulp & Paper Co. (I)	"	4,200,000	
Bates Mfg. Co. (I)	"	470,000	
Hallowell, Me. (M)	"	853,000	
Gardiner, Me. (M)	"	2,620,000	
Gardiner Paper Co. (I)	"	816,000	
S. D. Warren Co. (I)	"	720,000	
Randolph, Me. (M)	"	*	*To be combined in one plant with Gardiner, Randolph and S. Gardiner
Richmond, Me. (M)	"	220,000	
Farmingdale, Me. (M)	"	420,000	
Bath, Me. (M)	"	2,045,000	
Canning Co. (I)	"	*	*Included in costs for Bath, Me.
Ship Yard (I)	"	*	* " " " " " "
Metal Products Plant (I)	"	*	* " " " " " "
Wiscasset, Me. (M)	None		Town has a secondary treatment plant
Boothbay Harbor, Me. (M)	Secondary	210,000	
Bristol, Me. (M)	"	180,000	
Damariscotta, Me. (D)	"	965,000	
Newcastle, Me. (D)	"	237,000	
Waldoboro, Me. (M)	"	304.000	

Table IV-2 (Continued)

Source[1]	Recommended Treatment	Estimated Cost[2]	Remarks
Friendship, Me. (M)	Secondary	$ 98,000	
Thomaston, Me. (M)	"	886,000	
Rockland, Me. (M)	"	1,106,000	
Camden, Me. (M)	"	901,000	
North Haven, Me. (M)	"	59,000	
Northport, Me. (M)	"	150,000	
Belfast, Me. (M)	"	2,125,000	
Belfast Canning Co. (I)	"	1,100,000	
Maplewood Packing Co. (I)	"	960,000	
Penobscot Poultry Co. (I)	"	960,000	
Sherman and Co. (I)	"	58,000	
Searsport, Me. (M)	"	836,000	
Northern Chemical Industries, Inc. (I)	"	12,000	
Brewer, Me. (M)	"	2,050,000	
Standard Packaging Co. (I)	"	8,500,000	
Bangor, Me. (M)	"	5,241,000	
S. A. Maxfield (I)	"	580,000	
Stockton Springs (M)	"	100,000	
Hampden, Me. (M)	"	330,000	
Winterport, Me. (M)	"	190,000	
Frankfort, Me. (M)	"	77,000	
Bucksport, Me. (M)	"	238,000	
St. Regis Paper Co. (I)	"	9,000,000	
Machias, Me. (M)	"	260,000	
Eastport, Me. (M)	"	265,000	
Castine, Me. (M)	"	130,000	
Maine Maritime Academy (M)	"	27,000	
Ellsworth, Me. (M)	"	1,134,000	
Penobscot, Me.	"		
Maine Blueberry Growers (I)	"	58,000	

Table IV-2 (Continued)

Source[1]	Recommended Treatment	Estimated Cost[2]	Remarks
Hancock, Me.			
Hancock-Ellsworth Tanneries (I)		Undet.	
Trenton, Me.			
William Underwood Co.(I)		Undet.	
Mount Desert, Me. (M)	Secondary	1,421,000	
Bar Harbor, Me. (M)	"	744,000	
46 Towns*	Undet.		*There are 46 towns which have no municipal sewerage system, but which, along with an undetermined number of industries, discharge wastes through private outfalls.
Total		$64,863,000	

1. Parenthetical M, D and I following the listed waste source indicate municipal, domestic or industrial sources, respectively.

2. Estimated costs for municipal waste sources include costs for waste treatment facilities and interceptors, where required. Estimated costs for industrial waste sources include costs for waste treatment facilities only.

RECENT PROGRESS IN POLLUTION CONTROL

The State of Maine has, through its Legislature, adopted classification standards for most of its coast. In addition, the Maine Water Improvement Commission has made recent recommendations to the Legislature for upgrading the present standards of certain waters along the coast.

A study of the pollution of the navigable waters of the Penobscot River and Upper Penobscot Bay was completed in February 1967. Based on this study and authority contained in Section 10(d) of the Water Pollution Control Act, a federal enforcement conference was held at Belfast, Maine, on April 20 and 21, 1967. It was agreed that the conference would be reconvened in approximately four months. At that time, conferees are to submit a proposed time schedule for pollution abatement of sources affecting the quality of the navigable waters of the Penobscot River.

Maine provides funds for a grant-in-aid program amounting to 30 per cent of the project cost. Within the last five years, the FWPCA has provided grants to Augusta, Boothbay Harbor, Bristol, Richmond and Wiscasset for facilities with a combined construction cost of $3,146,000. In addition, grants have been approved for facilities to be constructed at a combined cost of $6,749,000 at Bangor, Bath, Thomaston and Waldoboro.

BACKGROUND FOR RECOMMENDATIONS

Pertinent Basin Characteristics

With the exception of Portland and vicinity, the northern coastal waters of Maine contain the major cities in the State and serve as the economic backbone of many of the smaller towns along the coast. The full-time resident population of the towns and cities bordering the coastal waters is on the order of 125,000, which increases manyfold during the summer recreational season.

The economy of many of the smaller coastal towns is closely related to the recreation, agriculture, food processing and shellfishing industries. Bangor and Augusta, however, have a more diversified economic base in the manufacturing field.

Major coastal streams in the basin are the Kennebec and Penobscot Rivers along which the cities of Augusta and Bangor are located. Recreational centers exist along the entire coast and include the summer resorts of Vinalhaven, Bar Harbor and Rockland, as well as Acadia National Park.

Present Water Quality

The present quality of the waters of the North Maine Coastal Basin is shown in Figures IV-2A and IV-2B; the waste contributors affecting the quality are shown in Table IV-3. There are, in addition, many sources of pollution discharging wastes through private outfalls for which information is not available. These sources include thirty-nine federal installations such as lighthouses, lifeboat stations and parks. In general, these sources contribute relatively small pollutional loads when considered individually, but fairly significant loads to local areas when considered in the aggregate. The qualities shown were determined from data contained in classification reports prepared by the Maine Water Improvement Commission and from studies of the Penobscot River performed by the FWPCA. For uniformity of presentation, an attempt has been made to show the quality of the waters in relation to the New England Interstate Water Pollution Control Commission Standards of Water Quality dated September 14, 1966. These standards of quality are shown in Appendix A.

The coastal waters themselves are generally good to excellent quality as judged by most quality parameters. There are many areas of the coast, however, which have coliform concentrations sufficiently high to hamper or preclude the taking of shellfish. Furthermore, in the estuarine reaches of the larger coastal streams and in sheltered bay areas, the water quality is significantly degraded and creates nuisance conditions.

The Kennebec River estuary is degraded from Augusta to the coast. About six miles upstream of Augusta the Kennebec River's quality is low enough to create nuisance conditions because of industrial and municipal wastes contributed upstream of Augusta. The quality of the Kennebec River flowing through Augusta and down to Merrymeeting Bay continues to create nuisance conditions sustained by the wastes from the Hudson Pulp and Paper Company, the Lipman Poultry Company and municipal wastes from Augusta. The water quality problems which exist are characterized by oxygen depletion, scums, sludge blankets, floating solids, including chicken entrails and feathers, odor and high bacterial pollution. Waste sulfite liquors provide an environment toxic to many fish and promote the growth of certain fungal organisms which clog screens of downstream water users. From Merrymeeting Bay to Bath, the quality of the water improves to Class D, and below Bath improves further to Class C. Dissolved oxygen concentrations are almost entirely absent in the reach from Augusta to Richmond. Below Richmond, the dissolved oxygen concentrations rise to a level at Bath on the order of 3 mg/l.

Based on data obtained prior to 1962, the estuary of the Sheepscot River was degraded to Class C in the vicinity of Wiscasset by sanitary wastes from Wiscasset and individual outlets. Nuisance conditions at times existed off the shores of Wiscasset, Maine. The degradation was caused by raw sewage discharges which affected the water quality spasmodically to the coast proper. Although data is not available to indicate any improvement in water quality, the construction of a secondary treatment plant at Wiscasset subsequent to 1962 may be expected to result in improved estuarine water quality.

The Damariscotta River estuary from tidehead to the coast is of generally good quality. Near the coast, the Damariscotta River estuary is degraded to Class C primarily by the sanitary wastes from a portion of Boothbay. On the coast itself, the quality is similarly degraded to Class C near Boothbay Harbor by local wastes. The existing water quality degradation is caused by the relatively high degree of bacterial pollution, and, at times, the water presents a poor appearance in the Boothbay Harbor area.

The coastal waters from the Damariscotta River estuary north to about Belfast, including the coastal stream estuaries, is of generally good quality. There are, however, localized areas which are degraded to Class C primarily because of bacterial pollution. These areas are located at population centers where sanitary and fish processing wastes discharged into bay or estuary areas do not receive the dilution afforded wastes discharged at the coast.

The Penobscot River estuary below Bangor is degraded to either Class D or to a quality resulting in nuisance conditions, depending on the tides and stream flow. This degraded quality exists downstream to about Bucksport and is characterized by depleted levels of dissolved oxygen, high bacterial pollution, solids deposition, sludge deposits and odors. Like the Kennebec River estuary, a significant cause of these conditions along the Penobscot River estuary is the wastes contributed to the intrastate portions of the river. In the estuary itself, major loads are contributed by the Bangor-Brewer municipal wastes and by industrial wastes of the Standard Packaging Company and the St. Regis Paper Company. Below Bucksport, the water quality improves somewhat to Class C.

Except for the bay and estuary areas at Belfast, Ellsworth and Eastport, the remainder of the Maine coast is free of degrading pollution. At Belfast, Ellsworth and Eastport, the water is degraded to Class D by industrial and municipal wastes. At Belfast and Eastport, the degraded quality is created by food and fish processing plants as well as by the municipal wastes. The water quality is affected mainly by bacterial pollution in addition to floating solids and grease from the processing plants at Belfast and Eastport. The remainder of the coastal waters are generally of good quality except in small bay areas where pollution from municipalities degrades the immediate area to Class C through bacterial pollution.

The pollution of the coastal waters of Maine precludes or impairs the potential and present uses of these waters for many purposes. The degraded quality of several portions of the coastal waters has impaired the propogation of fish and has caused fish kills in some areas in addition to preventing the passage of anadramous fish. High bacterial pollution in the estuaries and other bay areas has caused the closing of many shellfishing areas, and creates a threat to the present and future use of existing shellfishing areas. The recreational potential of many areas along the coast has been severely reduced by the effects of pollution. A threat exists to recreational centers due to poor aesthetic and public health considerations.

Table IV-3

NORTH MAINE COASTAL BASIN

Coastal Waters

Sources of Pollution

Source[1]	Coastal Water	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treatment	Waste Flow, Mgd.	Waste Load, P.E. of BOD
Winslow, Me.							
Scott Paper Co. (I)			Undet.	Pulp & Paper	Undet.	Undet.	1,620,000
Augusta, Me. (M)	Kennebec R.	21,080	17,000	Municipal	Primary	2.00	20,000
Lipman Poultry Co. (I)	"		Undet.	Poultry	None	0.30	9,150
Bates Mfg. Co. (I)	"		"	Starch & Dye	"	Undet.	1,750
Hudson Pulp & Paper (I)	"		"	Pulp & Paper	"	5.33	375,860
Hallowell, Me. (M)	"	3,169	2,900	Municipal	"	0.35	2,900
Gardiner, Me. (M)	"	6,897	6,700	Municipal	"	2.00	6,700
Gardiner Paper Co. (I)	"		Undet.	Paper	"	0.70	6,264
S. D. Warren Co. (I)	"		"	Paper	"	Undet.	Undet.
Randolph, Me. (M)	"	1,585	1,200	Municipal	"	"	1,200
Richmond, Me. (M)	"	2,185	1,500	"	" 2	"	1,500
Farmingdale, Me. (M)	"	1,941	600	"	"	"	600
Bath, Me. (M)	"	10,717	10,700	"	"	"	10,700
Canning Plant (I)	"		260		"	"	Undet.
Ship Yard (I)	"		600		"	"	"
Metal Products Plant (I)	"		400		"	"	"
Wiscasset, Me. (M)	Sheepscot R.	1,800	800[3]	Municipal	Secondary	"	"
Boothbay Harbor, Me. (M)	Atlantic O.	2,252	2,300[4]	"	Primary	"	"
Bristol, Me. (M)	"	1,441	1,475	"	Septic Tk. W/CL_2	"	1,475
Damariscotta, Me.[5]	Sheepscot R.		Undet.	Domestic	None	"	Undet.
New Castle, Me.[5]	"		"	Domestic	"	"	Undet.

Table IV-3 (Continued)

Source[1]	Coastal Water	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treatment	Waste Flow, Mgd.	Waste Load, P.E. of BOD
Waldoboro, Me. (M)	Medomak R.	2,882	400	Municipal	None	Undet.	400
Friendship, Me. (M)	Atlantic O.	806	180	"	"	0.02	180
Thomaston, Me. (M)	St. George R.	2,780	2,800	"	"	Undet.	2,800
State Prison (M)	"		300	Undet.	"	0.03	300
Rockland, Me. (M)	Atlantic O.	8,769	6,500	Municipal	"	Undet.	6,500
Camden, Me. (M)	"	3,988	4,000	"	"	"	4,000
North Haven, Me. (M)	"	384	120	"	"	"	120
Northport, Me. (M)	"	648	1,080	"	"	"	1,000
Belfast, Me. (M)	"	6,140	2,000	"	"	0.45	4,500
Belfast Canning Co. (I)	"		Undet.	Canning	"	0.42	15,600
Maplewood Packing Co. (I)	"		"	Poultry	Screening	0.80	13,500
Penobscot Poultry Co. (I)	"		"	Poultry	Screening	0.80	13,500
Sherman and Company	"		"	Undet.	Undet.	Undet.	1,000
Searsport, Me. (M)	"	1,838	1,000	Municipal	Primary(some)	"	1,000
Northern Chemical Industries, Inc. (I)	"		Undet.	Chemical	Primary	"	100
Brewer, Me. (M)	Penobscot R.	9,009	7,600	Municipal	None	"	8,600
Standard Pkg. Corp. (I)	"		Undet.	Pulp & Paper	"	20.3	710,000
Bangor, Me. (M)	"	38,912	30,000	Pulp & Paper	"	Undet.	37,000
S. A. Maxfield Co. (I)	"		Undet.	Wool	"	10.6	6,000
Stockton Springs, Me. (M)	Atlantic O.	980	50	Municipal	Septic Tk.	Undet.	50
Hampden, Me. (M)	Penobscot R.	4,583	1,900	"	None	"	2,800
Winterport, Me. (M)	"	2,088	800	"	"	"	1,000
Frankfort, Me. (M)	"	692	50	"	"	"	50
Bucksport, Me. (M)	"	2,327	1,700	"	"	"	2,000
St. Regis Paper Co. (I)	"		Undet.	Pulp & Paper	"	"	370,000
Machias, Me. (M)	Machias R.	2,614	1,800	Municipal	"	"	1,800
Eastport, Me. (M)	Atlantic O.	2,537	2,200	"	"	"	2,200

Table IV-3 (Continued)

Source[1]	Coastal Water	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treatment	Waste Flow, Mgd.	Waste Load, P.E. of BOD
Waldoboro, Me. (M)	Medomak R.	2,882	400	Municipal	None	Undet.	400
Friendship, Me. (M)	Atlantic O.	806	180	"	"	0.02	180
Thomaston, Me. (M)	St. George R.	2,780	2,800	"	"	Undet.	2,800
State Prison (M)	"		300	Undet.	"	0.03	300
Rockland, Me. (M)	Atlantic O.	8,769	6,500	Municipal	"	Undet.	6,500
Camden, Me. (M)	"	3,988	4,000	"	"	"	4,000
North Haven, Me. (M)	"	384	120	"	"	"	120
Northport, Me. (M)	"	648	1,080	"	"	"	1,000
Belfast, Me. (M)	"	6,140	2,000	"	"	0.45	4,500
Belfast Canning Co. (I)	"		Undet.	Canning	"	0.42	15,600
Maplewood Packing Co. (I)	"		"	Poultry	Screening	0.80	13,500
Penobscot Poultry Co. (I)	"		"	Poultry	Screening	0.80	13,500
Sherman and Company	"		"	Undet.	Undet.	Undet.	1,000
Searsport, Me. (M)	"	1,838	1,000	Municipal	Primary(some)	"	1,000
Northern Chemical Industries, Inc. (I)	"		Undet.	Chemical	Primary	"	100
Brewer, Me. (M)	Penobscot R.	9,009	7,600	Municipal	None	"	8,600
Standard Pkg. Corp. (I)	"		Undet.	Pulp & Paper	"	20.3	710,000
Bangor, Me. (M)	"	38,912	30,000	Pulp & Paper	"	Undet.	37,000
S. A. Maxfield Co. (I)	"		Undet.	Wool	"	10.6	6,000
Stockton Springs, Me. (M)	Atlantic O.	980	50	Municipal	Septic Tk.	Undet.	50
Hampden, Me. (M)	Penobscot R.	4,583	1,900	"	None	"	2,800
Winterport, Me. (M)	"	2,088	800	"	"	"	1,000
Frankfort, Me. (M)	"	692	50	"	"	"	50
Bucksport, Me. (M)	"	2,327	1,700	"	"	"	2,000
St. Regis Paper Co. (I)	"		Undet.	Pulp & Paper	"	"	370,000
Machias, Me. (M)	Machias R.	2,614	1,800	Municipal	"	"	1,800
Eastport, Me. (M)	Atlantic O.	2,537	2,200	"	"	"	2,200

Table IV-3 (Continued)

Source[1]	Coastal Water	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treatment	Waste Flow, Mgd.	Waste Load, P.E. of BOD
Castine, Me. (M)	Bagaduce R.	824	850	Municipal	None	Undet.	2,000
Maine Maritime Acad. (M)	"		350	Sanitary	"	"	600
Ellsworth, Me. (M)	Union R.	4,444	2,300	Municipal	"	"	2,300
Penobscot, Me. (M)							
Penobscot Canning Company (I)	"		Undet.	Food Proc.	"	"	1,000
Hancock, Me. (M)	Atlantic O.	806	850	Municipal	"	"	Undet.
Hancock-Ellsworth Tanneries (I)	"		Undet.	Grease & Solids	"	"	"
Tremont, Me. (M)							
William Underwood Co. (I)	"		Undet.	Fish Wastes	"	"	"
Mount Desert, Me. (M)	"	1,663	700	Municipal	"	"	700
Bar Harbor, Me. (M)	"	2,444	2,450	Municipal	"	"	2,450
46 Towns[6]		38,400	Undet.	Domestic & Industrial	"	"	Undet.

1. Parenthetical M and I following the listed waste source indicate municipal or industrial sources, respectively.

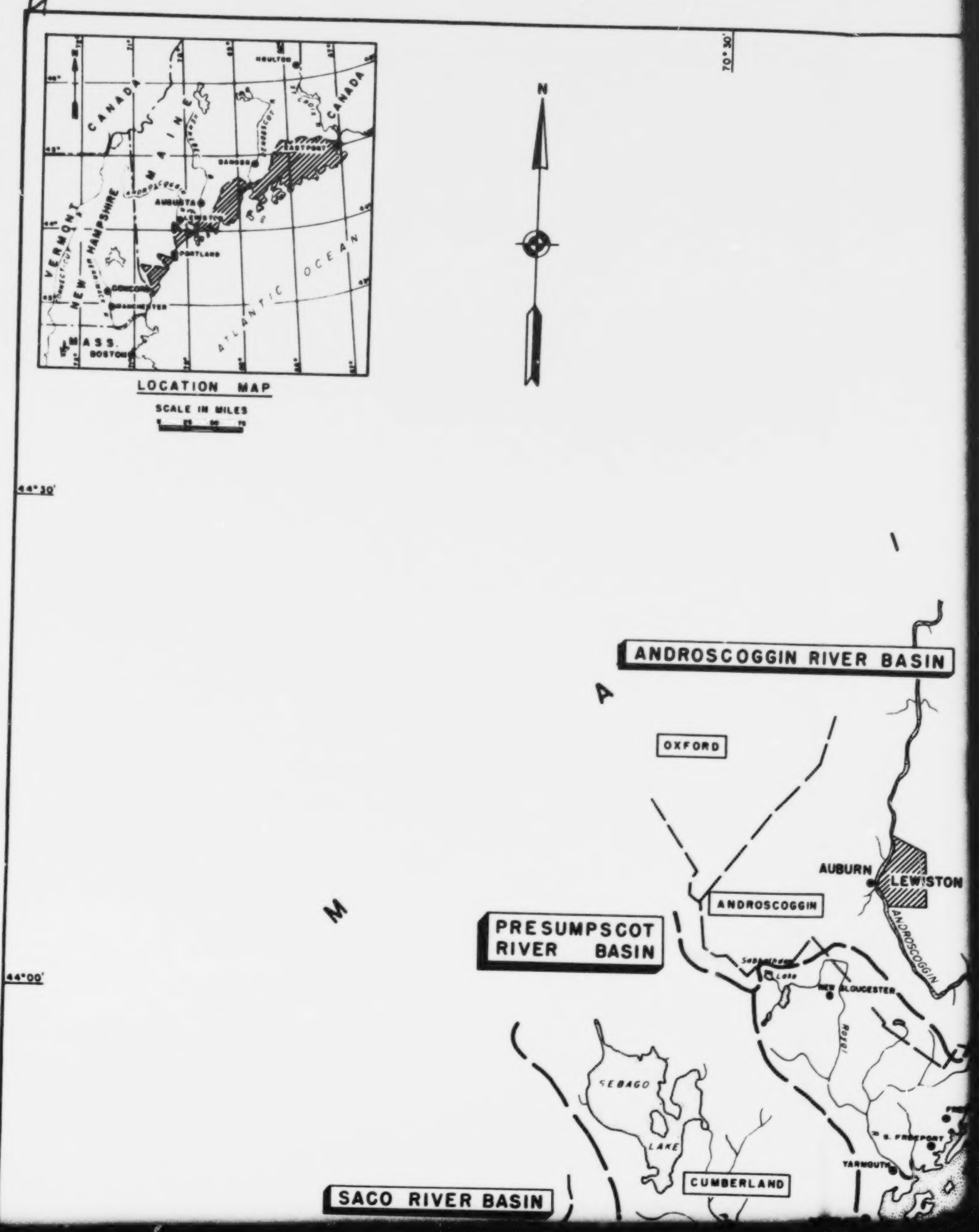
2. Primary Plant under construction.

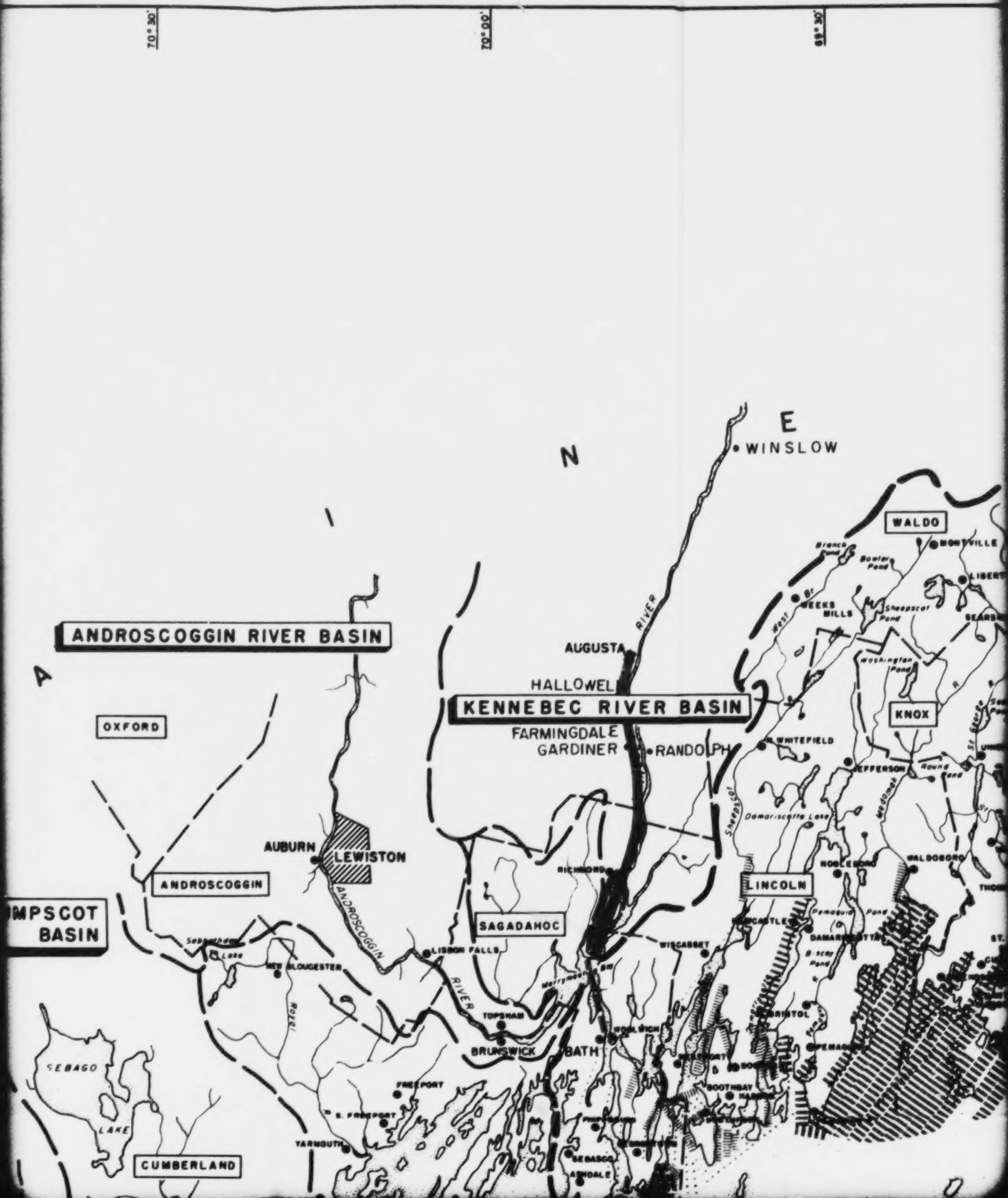
3. Includes wastes from Steam Generating Plant.

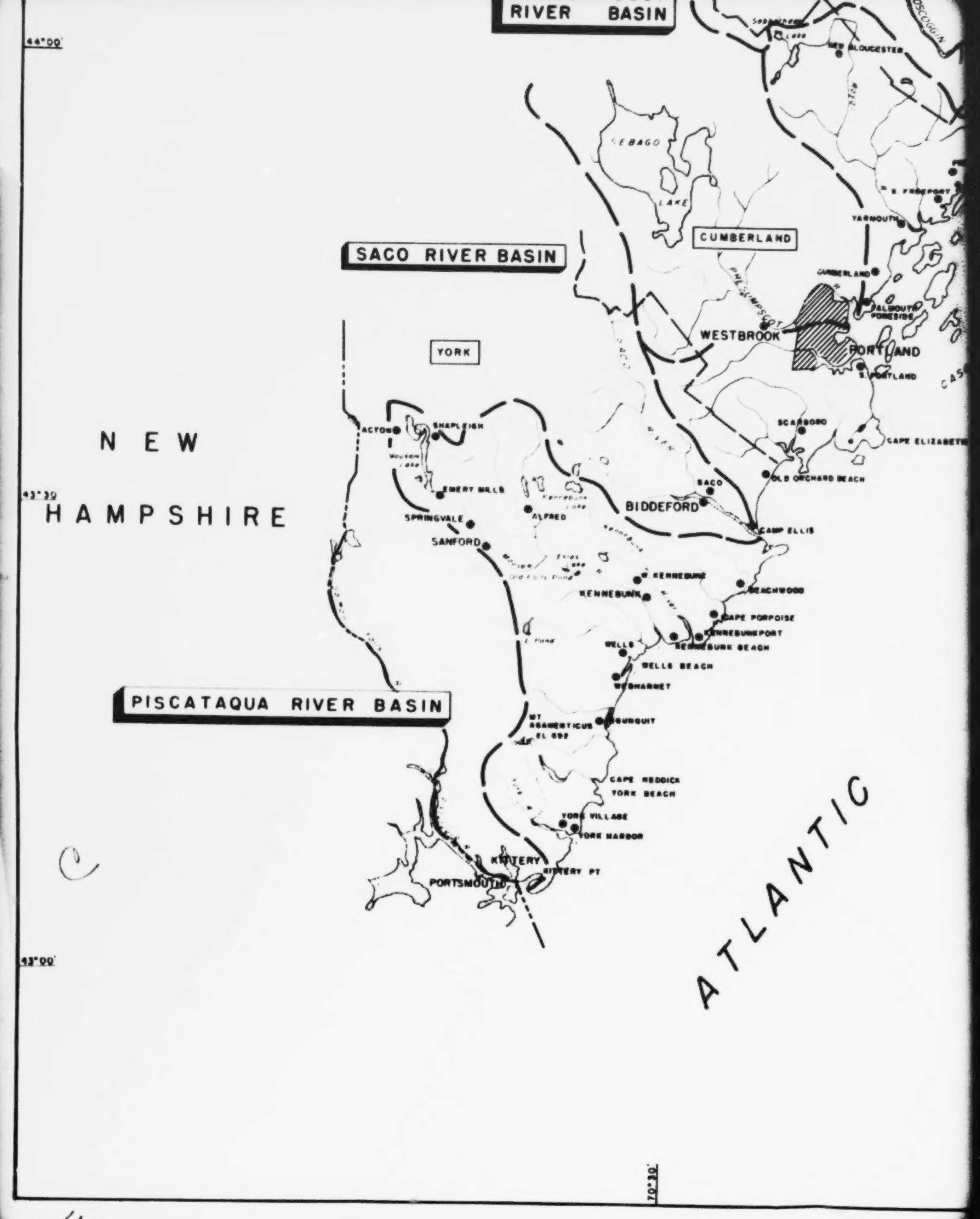
4. Also 3,000 people, 5 food processing plants and 2 stores are served by 250 separate outfalls.

5. Damariscotta and New Castle are served by private outlets.

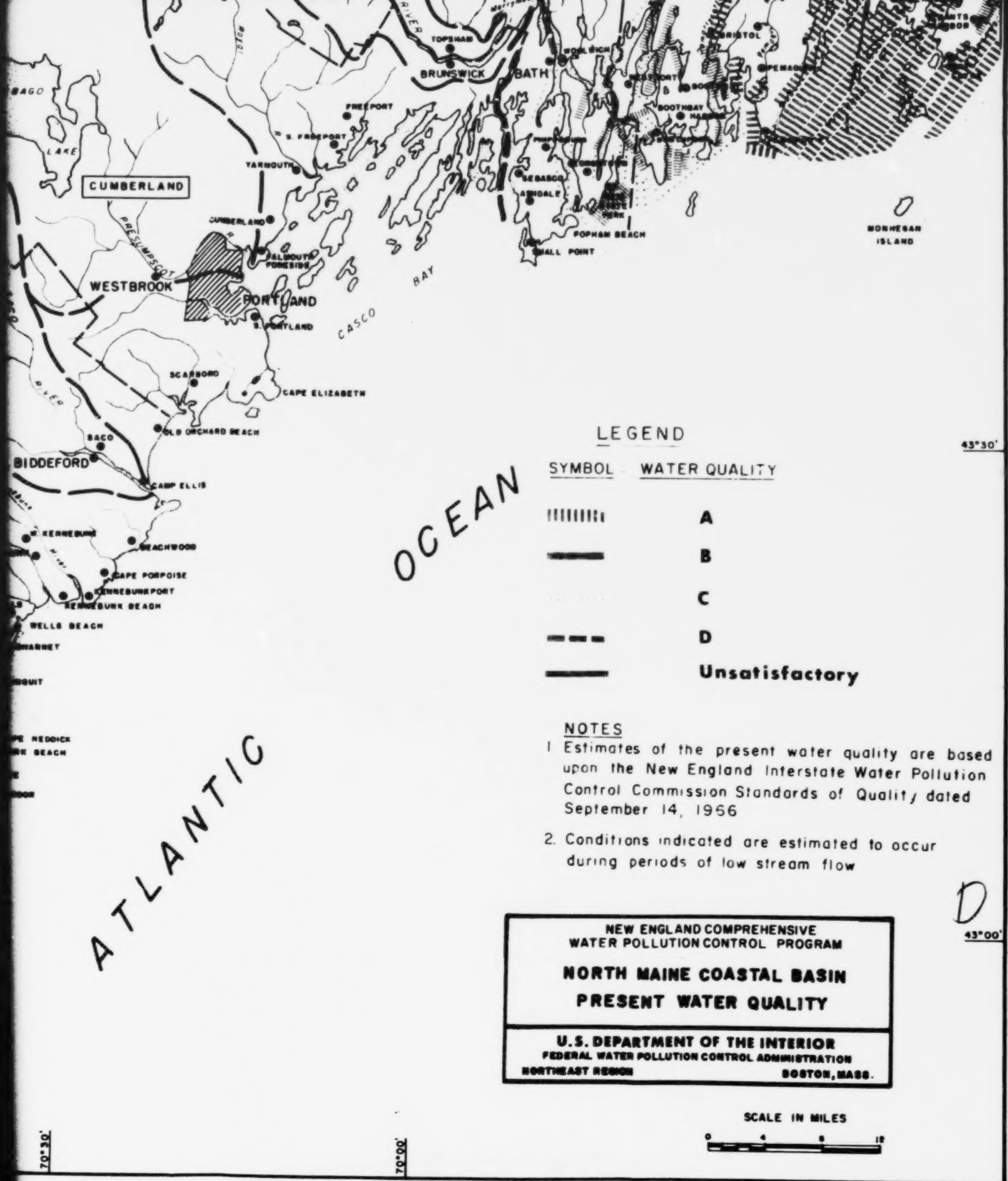
6. There are 46 towns with a combined population of 38,400 and an undetermined number of small industries, portions of which discharge wastes through private outfalls to the coastal area.


LOCATION MAP
SCALE IN MILES
0 25 50 75
CANADA
MAINE
VERMONT
NEW HAMPSHIRE
MASS.
BOSTON
CONCORD
MANCHESTER
PORTLAND
AUGUSTA
LEWISTON
BANGOR
EASTPORT
HOULTON
ATLANTIC OCEAN
ANDROSCOGGIN
KENNEBEC
PENOBSCOT
CONNECTICUT
MERRIMACK
N
70° 30'
44° 30'
44° 00'
ANDROSCOGGIN RIVER BASIN
A
OXFORD
AUBURN
LEWISTON
ANDROSCOGGIN
M
PRESUMPSCOT RIVER BASIN
Sabbathday Lake
NEW GLOUCESTER
ANDROSCOGGIN
Royal
SEBAGO LAKE
FREEPORT
S. FREEPORT
YARMOUTH
CUMBERLAND
SACO RIVER BASIN


70° 30'
70° 00'
69° 30'
E
WINSLOW
N
I
A
ANDROSCOGGIN RIVER BASIN
KENNEBEC RIVER BASIN
MPSCOT BASIN
OXFORD
ANDROSCOGGIN
CUMBERLAND
SAGADAHOC
LINCOLN
KNOX
WALDO
AUGUSTA
HALLOWEL
FARMINGDALE
GARDINER
RANDOLPH
RIVER
AUBURN
LEWISTON
ANDROSCOGGIN
RIVER
LISBON FALLS
NEW GLOUCESTER
TOPSHAM
BRUNSWICK
BATH
WOOLWICH
RICHMOND
WISCASSET
FREEPORT
S. FREEPORT
YARMOUTH
SEBASCO
SEBAGO
LAKE
Sabbathday Lake
Merrymeeting
Branch Pond
Bowler Pond
MONTVILLE
LIBERT
WEEKS MILLS
West Br
Sheepscot Pond
SEARSM
Washington Pond
N. WHITEFIELD
JEFFERSON
Round Pond
Sheepscot
Damariscotta Lake
Medomak
St. George
NOBLEBORO
WALDOBORO
NEWCASTLE
DAMARISCOTTA
Pemaquid Pond
Biscay Pond
BRISTOL
PEMAQUID
BOOTHBAY HARBOR
THOM
ST.


RIVER BASIN
44°00'
SCOGGIN
Sabbathday
Lake
NEW GLOUCESTER
SEBAGO
LAKE
S. FREEPORT
YARMOUTH
CUMBERLAND
SACO RIVER BASIN
CUMBERLAND
PRESUMPSCOT
FALMOUTH FORESIDE
WESTBROOK
PORTLAND
S. PORTLAND
CAS
YORK
SACO
SCARBORO
CAPE ELIZABETH
NEW HAMPSHIRE
ACTON
SHAPLEIGH
Mousam Lake
43°30'
EMERY MILLS
ALFRED
SACO
OLD ORCHARD BEACH
BIDDEFORD
SPRINGVALE
SANFORD
CAMP ELLIS
Old Falls Pond
W. KENNEBUNK
BEACHWOOD
KENNEBUNK
CAPE PORPOISE
KENNEBUNKPORT
KENNEBUNK BEACH
WELLS
WELLS BEACH
WEBHANNET
PISCATAQUA RIVER BASIN
MT AGAMENTICUS EL 692
OGUNQUIT
CAPE NEDDICK
YORK BEACH
YORK VILLAGE
YORK HARBOR
C
KITTERY
KITTERY PT
PORTSMOUTH
43°00'
ATLANTIC
70°30'

F


TOPSHAM
BRUNSWICK
BATH
WOOLWICH
BRISTOL
BOOTHBAY HARBOR
FREEPORT
S. FREEPORT
YARMOUTH
CUMBERLAND
CUMBERLAND
SEBASCO
ARNDALE
POPHAM BEACH
SMALL POINT
MONHEGAN ISLAND
PRESUMPSCOT
WESTBROOK
FALMOUTH FORESIDE
PORTLAND
S. PORTLAND
CASCO BAY
SCARBORO
CAPE ELIZABETH
OLD ORCHARD BEACH
SACO
BIDDEFORD
CAMP ELLIS
RIVER
LAKE
ATLANTIC
OCEAN
W. KENNEBUNK
BEACHWOOD
CAPE PORPOISE
KENNEBUNKPORT
KENNEBUNK BEACH
WELLS BEACH
CAPE NEDDICK
43°30'
43°00'
70°30'
70°00'
SCALE IN MILES
0
4
8
12

LEGEND

SYMBOL	WATER QUALITY
▥	A
▬	B
┈	C
- - -	D
▬	Unsatisfactory

NOTES

1. Estimates of the present water quality are based upon the New England Interstate Water Pollution Control Commission Standards of Quality dated September 14, 1966
2. Conditions indicated are estimated to occur during periods of low stream flow

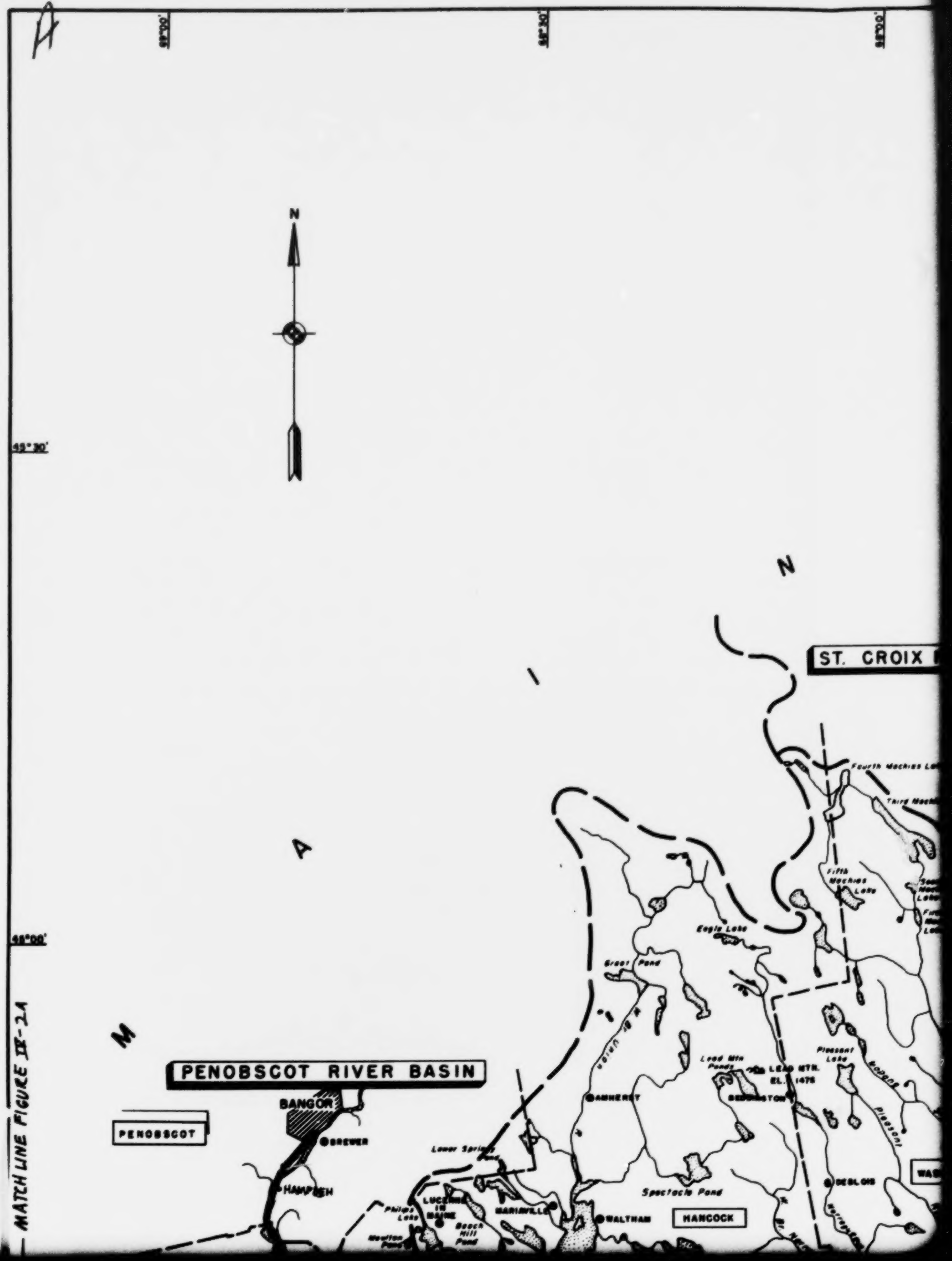
D

NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM

NORTH MAINE COASTAL BASIN
PRESENT WATER QUALITY

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION BOSTON, MASS.

FIGURE IV-2A


A
69°00'
68°30'
68°00'
N
45°30'
45°00'
MATCH LINE FIGURE II-2A
M
A
I
N
ST. CROIX
PENOBSCOT RIVER BASIN
PENOBSCOT
BANGOR
BREWER
HAMPDEN
Fourth Machias La
Third Machi
Fifth Machias Lake
Eagle Lake
Great Pond
Union
Lead Mtn Ponds
LEAD MTN. EL. 1475
BEDDINGTON
Pleasant Lake
Pleasant
AMHERST
Lower Springy Pond
Philips Lake
Moulton Pond
LUCERNE IN MAINE
Beech Hill Pond
MARIAVILLE
WALTHAM
HANCOCK
Spectacle Pond
DEBLOIS
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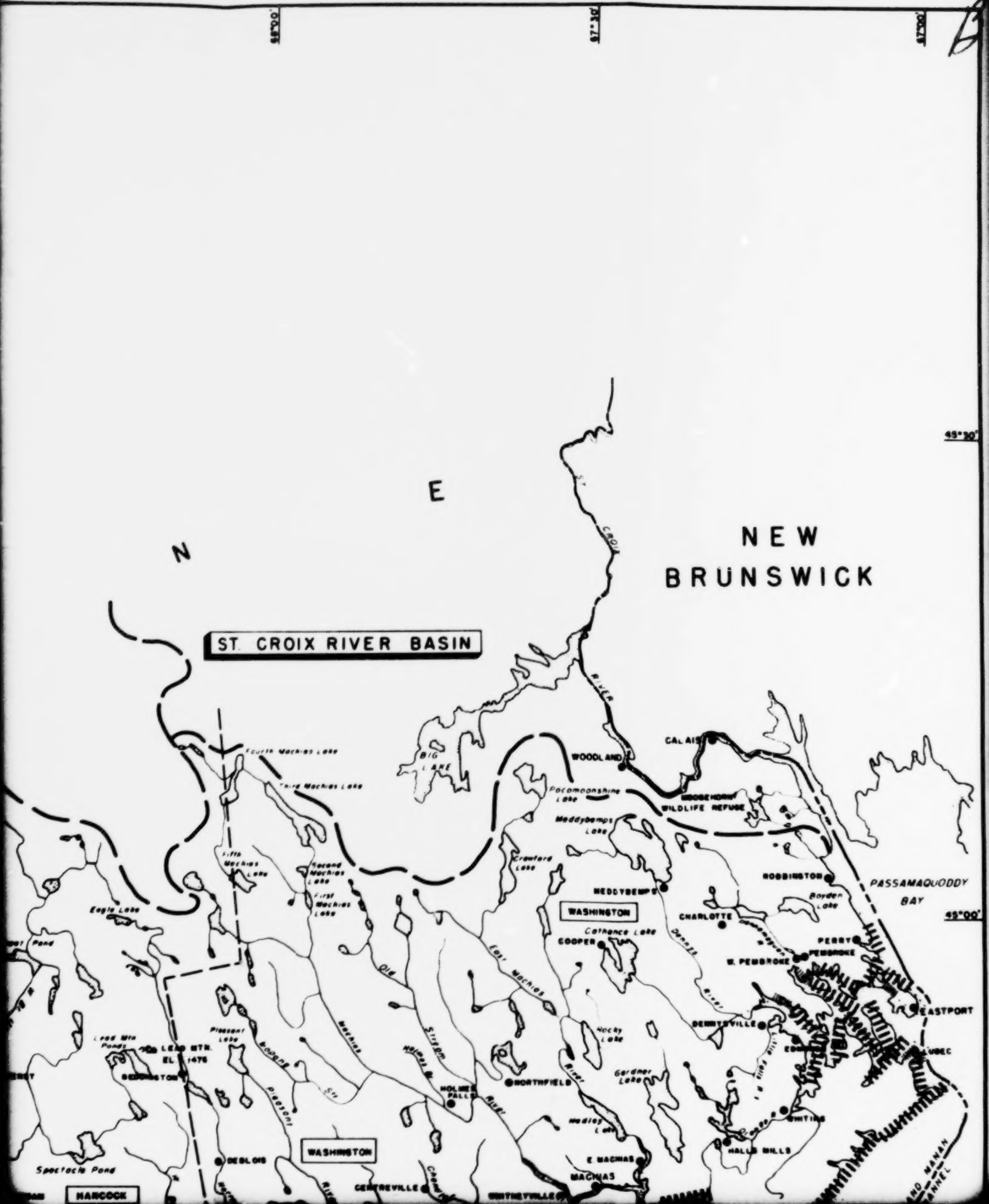
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Second Machias Lake
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Eagle Lake
Pond
Lead Mtn Ponds
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Pleasant River
Spectacle Pond
HANCOCK
WASHINGTON
DEBLOIS
Old Stream
Machias River
Holmes Br.
HOLMES FALLS
CENTREVILLE
WHITNEYVILLE
MACHIAS
E. MACHIAS
East Machias River
NORTHFIELD
Hadley Lake
Gardner Lake
Rocky Lake
Crawford Lake
Pocomoonshine Lake
Meddybemps Lake
MEDDYBEMPS
WASHINGTON
Cathance Lake
COOPER
WOODLAND
CALAIS
MOOSEHORN WILDLIFE REFUGE
ROBBINSTON
Boyden Lake
PASSAMAQUODDY BAY
CHARLOTTE
Dennys River
PERRY
PEMBROKE
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EASTPORT
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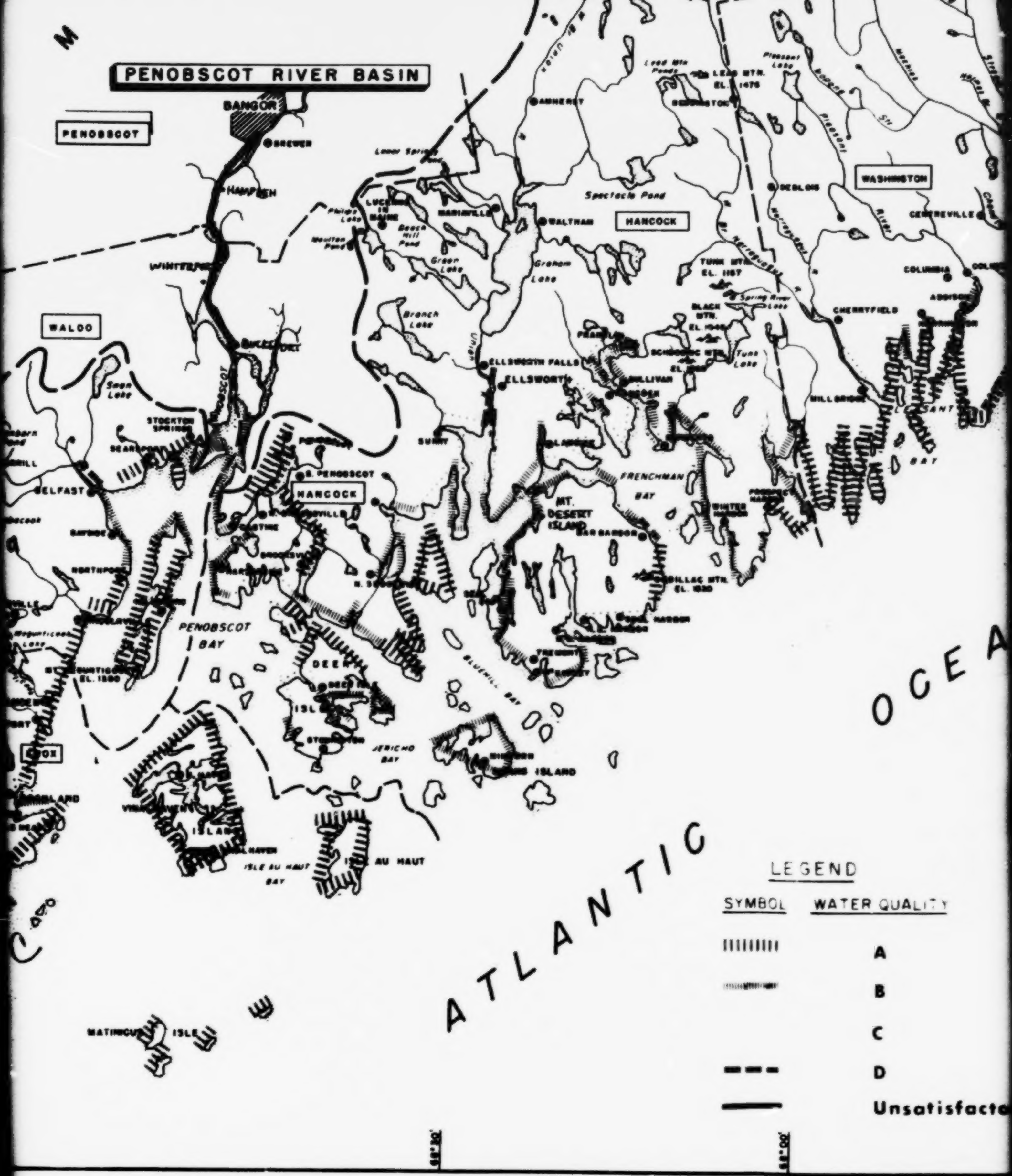M
PENOBSCOT RIVER BASIN
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BREWER
HAMPDEN
WINTERPORT
WALDO
BUCKSPORT
Swan Lake
STOCKTON SPRINGS
SEARSPORT
BELFAST
NORTHPORT
PENOBSCOT BAY
MT. BATTIE
CAMDEN
KNOX
ROCKLAND
VINALHAVEN
ISLE AU HAUT BAY
ISLE AU HAUT
MATINICUS ISLE
HANCOCK
S. PENOBSCOT
CASTINE
BROOKSVILLE
DEER ISLE
STONINGTON
JERICHO BAY
BLUEHILL BAY
SWANS ISLAND
SURRY
ELLSWORTH FALLS
ELLSWORTH
Branch Lake
Green Lake
Phillips Lake
Lucerne in Maine
Beech Hill Pond
Moulton Pond
Lower Spring Pond
MARIAVILLE
WALTHAM
Graham Lake
Spectacle Pond
AMHERST
Lead Mtn Ponds
LEAD MTN. EL. 1475
BEDDINGTON
Pleasant Lake
WASHINGTON
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COLUMBIA
ADDISON
CHERRYFIELD
MILLBRIDGE
TUNK MTN. EL. 1157
BLACK MTN. EL. 1049
Spring River Lake
Tunk Lake
FRANKLIN
SCHOODIC MTN.
SULLIVAN
HANCOCK
FRENCHMAN BAY
MT. DESERT ISLAND
BAR HARBOR
CADILLAC MTN. EL. 1530
SEAL HARBOR
TREMONT
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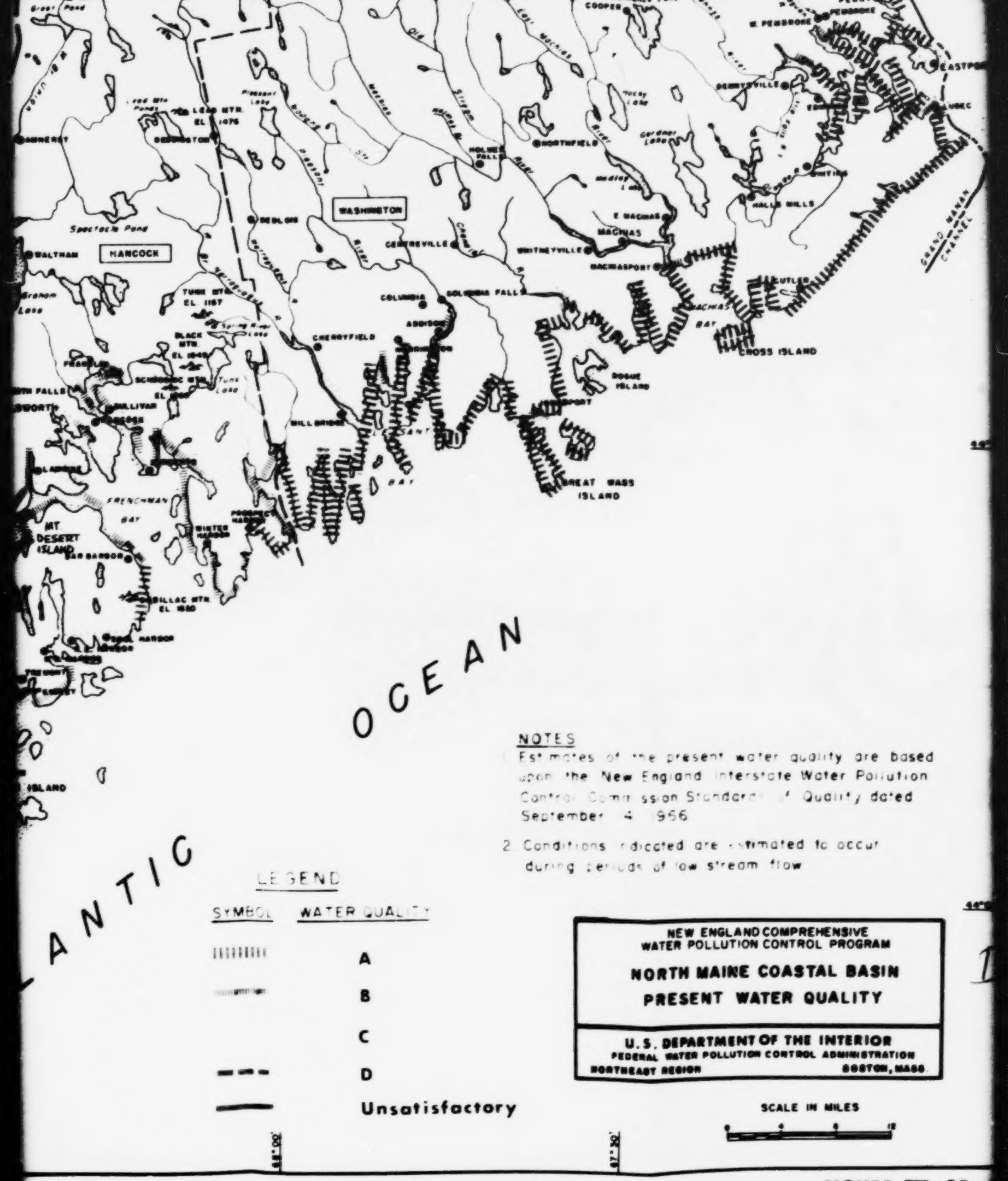
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WHITNEYVILLE
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E. MACHIAS
MACHIASPORT
MACHIAS BAY
CUTLER
CROSS ISLAND
ROGUE ISLAND
GREAT WASS ISLAND
Gardner Lake
DENNYSVILLE
WHITING
COOPER
W. PEMBROKE
PEMBROKE
EASTPORT
LUBEC
GRAND MANAN CHANNEL
LEGEND
SYMBOL
WATER QUALITY
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SCALE IN MILES
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NOTES

1. Estimates of the present water quality are based upon the New England Interstate Water Pollution Control Commission Standards of Quality dated September 14, 1966.
2. Conditions indicated are estimated to occur during periods of low stream flow.

NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM

NORTH MAINE COASTAL BASIN
PRESENT WATER QUALITY

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION BOSTON, MASS.

FIGURE IV-2B

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CHAPTER V
ANDROSCOGGIN RIVER BASIN

SUMMARY

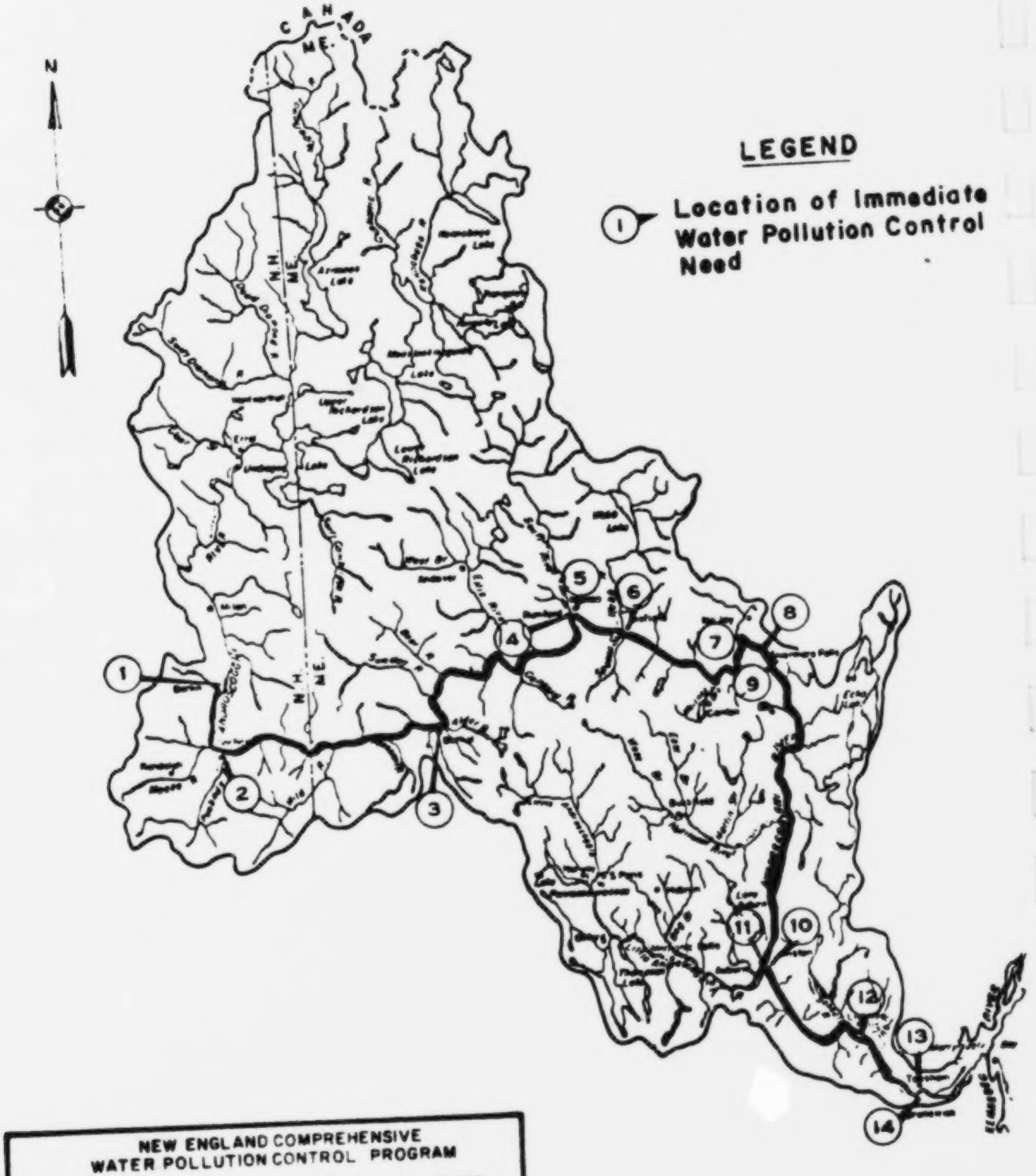
Major water quality problems of the interstate waters in the Androscoggin River Basin occur along the River from Berlin, New Hampshire, to its confluence with Merrymeeting Bay on the Maine Coast. Untreated waste discharges from paper industries and urbanized municipalities result in severe water quality degradation along this reach, and cause prolonged periods of nuisance conditions. The total BOD discharged to the river is estimated at 1,140,000 P. E.

Industrial operations along this interstate stream consist of wood, paper, and textiles, all of which account for about 91 per cent of the total BOD load discharged to the river. The largest of these industrial sources are the Brown Paper Company in Berlin and Gorham, New Hampshire, the Oxford Paper Company in Rumford, Maine, and the International Paper Company in Jay and Livermore Falls, Maine, which together are responsible for 80 per cent of the total BOD load released directly to the river.

The major sources of municipal pollution along the Androscoggin River are Berlin, New Hampshire, and Rumford, Lewiston, Auburn, and Brunswick, Maine. Although over 80 per cent of the population contributing wastes to the river is located in these five cities, their total waste contribution is only about 8 per cent of the total BOD load.

Pollution control is required at major industrial and population centers to achieve adequate levels of water quality. Pollution abatement is estimated to require a minimum expenditure of $44,000,000 by the contributing cities, towns and industries.

Evaluation of water quality problem areas indicates that immediate pollution control action should be directed toward the industrial sources along the river between Rumford and Livermore Falls. Major industrial waste water discharges in the Rumford and Livermore Falls area have resulted in nuisance conditions along several miles of the river above Lewiston. Attention to pollution abatement in these two areas will significantly improve the water quality before the river passes through the major population centers. Immediate water pollution control needs are summarized in Table V-1, and are shown in Figure V-1. Although the priorities recommended were based on upgrading large reaches of the stream, they are not intended to prevent or delay the initiation or completion of independent pollution control programs by either municipalities or industries in New Hampshire and Maine.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14
SCALE IN MILES

LEGEND

① Location of Immediate Water Pollution Control Need

NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM

ANDROSCOGGIN RIVER BASIN

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION BOSTON, MASS.

FIGURE V-1

Table V-1
ANDROSCOGGIN RIVER BASIN
Androscoggin River
Summary of Immediate Water Pollution Control Needs

Location Map Key No.	Responsibility	Need	Priority[1]
4	Oxford Paper Co., Rumford, Me.	Secondary Waste Treatment	A
7,8,9	International Paper Co., Chisholm and Livermore Falls, Me.	"	A
1	Brown Co., Berlin, N.H.	"	B
1	City of Berlin, N.H.	"	B
2	Brown Co., Gorham, N.H.	"	B
2	Town of Gorham, N.H.	"	B
10, 11	Cities of Lewiston and Auburn, Me.	"	B
10	Bates Mfg. Co. and Pepperel Mfg. Co.	"	B
4	Town of Rumford, Me.	"	B
12	U.S. Gypsum Co. and Coop Textile Co., Lisbon, Me.	"	B
14	Pejepscot Paper Co.,	"	B
3,5,6, 7,8,12, 13, 14	Towns of Bethel, Mexico, Dixfield, Chisholm, Jay, Lisbon, Brunswick and Topsham, Me.	"	C

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[1] Priorities of actions are divided into three categories based on their impact on water quality improvements.

IMMEDIATE POLLUTION CONTROL NEEDS

The large proportion of the total waste load contributed by industrial activities and cities indicates that immediate pollution abatement measures be directed toward both of these sources. In view of the magnitude of the pollutional loads, secondary treatment or its equivalent is recommended immediately.

The water quality of the Androscoggin River from Rumford to the Lewiston-Auburn area is seriously degraded with a significant portion of this reach creating nuisance conditions. These conditions are due largely to untreated waste discharges from plants of the Oxford and International Paper Companies. The Brown Paper Company, which discharges wastes upstream of Rumford, contributes to the problem by reducing the water quality before this reach.

Immediate abatement of wastes from the Oxford and International Paper Companies are recommended to ameliorate the nuisance conditions in this reach. Although wastes from the Brown Paper Company contribute to the problem, the partial downstream recovery suggests that this source of pollution could have secondary priority to the Oxford and International Paper Companies as long as the present production doesn't increase. Implementation of recommended pollution control measures by the Oxford and International Paper Companies would result in an estimated improvement in water quality to Class C in the reach from Gilead to the Auburn-Lewiston area.

After pollution in the above reach has been dealt with, secondary

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1. Based upon New England Interstate Water Pollution Control Commission Water Quality Standards shown in Appendix A.

attention should be directed to wastes from the Brown Paper Company and municipal wastes from Berlin, New Hampshire. It is estimated that abatement of these sources will upgrade the reach of the Androscoggin from Berlin, New Hampshire, to Gilead, Maine, to Class C, and will contribute to further upgrading of downstream reaches.

Municipal and industrial wastes from the Lewiston-Auburn area contribute to the present Class D waters of the Androscoggin from Lewiston to Lisbon Falls; abatement of these sources is recommended following the initiation of pollution control activities on major upstream sources. Because of the pollution contributed by the Little Androscoggin River in this reach, abatement of pollution in the Auburn-Lewiston area may not be sufficient to upgrade the quality to Class C; however, without reduction of pollution from this source, upgrading will not be possible at all.

Further abatement measures are recommended for wastes from Rumford, the U. S. Gypsum Company, and the Pejepscot Paper Company. The implementation of the above recommendations will result in essentially complete abatement of major sources of pollution. Although a number of smaller communities along the river discharge some pollution, their contributions are not considered to be significant. Abatement of these sources should receive attention after other more serious sources have been resolved, unless specific engineering studies indicate that it is economical to combine the wastes from these smaller towns with industrial treatment facilities.

COSTS

Estimates of costs for recommended pollution abatement measures have been based on provisions for secondary treatment, including disinfection, of all waste discharges. The estimates, in Table V-2, were prepared by FWPCA utilizing costs obtained from consulting engineering and state classification reports, state agencies, and generalized treatment plant cost curves. These costs have been adjusted where necessary. These estimates serve only to indicate the order of magnitude of financial investment needed to abate pollution on the interstate streams of a basin and do not replace the more detailed estimates developed as a result of engineering studies for specific municipalities or industries. Pollution abatement facilities for sources discharging wastes to the interstate waters of the Androscoggin River Basin will require a minimum expenditure of approximately $44,000,000.

Table V-2
ANDROSCOGGIN RIVER BASIN
Androscoggin River
Recommended Abatement Measures and Estimated Costs

Source[1]	Recommended Treatment	Estimated Cost[2]	Remarks
Berlin, N. H. (M&I)	Secondary	$ 6,324,000	
Brown Co. (I)	"	*	*Included with Berlin treatment
Gorham, N. H. (M&I)	"	1,602,000	
Brown Co. (I)	"	*	*Included with Gorham treatment
Bethel, Me. (M)	"	581,000	
Rumford, Me. (M)	"	1,519,000	
Oxford Paper Co. (I)	"	6,500,000	
Mexico, Me. (M)	"	1,979,000	
Dixfield, Me. (M)	"	439,000	
Jay, Me.			
Jay Village (M)	"	351,000	
International Paper Co. (I)	"	6,500,000	
Chisholm (M)	"	590,000	
International Paper Co. (I)	"	850,000	
Livermore Falls, Me. (M)	"	704,000	
International Paper Co. (I)	"	*	*Included with International Paper Co., Chisholm
Auburn & Lewiston, Me. (M&I)	"	12,103,000	
Lisbon, Me. (M)	"	781,000	
Lisbon Weaving Coop. (I)	"	379,000	
U. S. Gypsum Co. (I)	"	1,100,000	
Brunswick, Me. (M&F)	"	404,000*	*Includes Naval Air Station
Pejepscot Paper Co. (I)	"	393,000	
Topsham, Me. (M)	"	930,000	
Air Force Station (F)	"	33,000	
Total		$44,062,000	

1. Parenthetical M, I and F following the listed waste source indicate municipal, industrial or federal sources, respectively.

2. Estimated costs for municipal waste sources include costs for waste treatment facilities and interceptors, where required. Estimated costs for industrial waste sources include costs for waste treatment facilities only.

RECENT PROGRESS IN POLLUTION CONTROL

The pollution problems of the Androscoggin have been recognized since 1930. As early as 1940, obnoxious conditions and resulting public outcry led to court action against the paper companies. Because of this and subsequent action, an administrator was appointed with authority to regulate activities of the pulp and paper mills and establish quotas for allowable waste discharges. Pollution by these mills has been controlled by a "Pollution Factor" by which the allowable discharge of sulfite wastes or its equivalent is related to units of streamflow. Discharge quotas, as measured quantitatively by this "Pollution Factor", have been reduced from 5.0 in 1941 to 0.49 in 1960.

Process changes within the industries and the closing of several mills have reduced pollutional loads. In 1958, the Brown Paper Company materially reduced its waste sulfite liquor discharge, and the Oxford Paper Company replaced two sulfite mills with a new Kraft mill.

Through 1962, efforts to regulate pollution were directed to prevention of public nuisances in the Auburn-Lewiston area, and data indicates that these measures were successful.

Although pollution has been reduced, adverse effects have not been eliminated. The improvements resulted from measures taken by the Brown, Oxford and International pulp and paper industries.

In 1962 and 1963, a conference in the matter of pollution of the Androscoggin was called by the Secretary of Health, Education and Welfare. Representatives of the States of Maine and New Hampshire and the New England Interstate Water Pollution Control Commission participated in discussions but did not sit as conferees.

Subsequent to the conferences several meetings took place between representatives of the Department of Health, Education, and Welfare and the states of Maine and New Hampshire. Agreement was reached on the classification of and abatement program for the Androscoggin River. Schedules called for the classification of the Androscoggin to be finished by 1967 and construction of all needed pollution abatement facilities to be completed by 1976.

The State of Maine has provided that the Water Improvement Commission make recommendations to each legislature with respect to the classification of the rivers based on standards of quality and use. In this respect, the Commission in 1966 recommended that the Androscoggin in Maine be classified as Class C. The Commission also recommended that certain quality criteria be maintained at Gilead under low flow conditions and further recommended a maximum BOD load on the river at this point. The Legislature is expected to act on these recommendations during the current session.

Similarly, the New Hampshire Water Pollution Commission recommended in 1966 that the Androscoggin River, from Lake Umbagog to Berlin, New Hampshire, be classified B-1 (for purposes of this report referred to as Class B), and from Berlin to the Maine-New Hampshire State line as Class C.

Maine and New Hampshire both provide funds for grant-in-aid programs amounting to 30 and 40 per cent, respectively, of the cost of the project. The New Hampshire grant-in-aid program was increased from 30 to 40 per cent by the 1965 Legislature.

Within the last five years, the FWPCA has authorized grants-in-aid for the construction of primary and secondary treatment facilities and laterals along the Androscoggin River, amounting to slightly over $2,000,000. These facilities are now under construction at Auburn, Lewiston and Brunswick, Maine. To date, the FWPCA does not have any applications for grants under consideration for construction of pollution abatement facilities along the Androscoggin River.

Pertinent Basin Characteristics

The Androscoggin River, with its headwaters in the Umbagog Lake on the Maine-New Hampshire border, flows through New Hampshire and Maine and empties into Merrymeeting Bay on the Maine Coast.

This river has been a bulwark of the industrialization of the area and contains many dams for power and industrial water supply purposes. Flows are well regulated by a dam at Errol, New Hampshire, and by twenty-two other dams on the river. Errol Dam, the largest of the dams, retains about 90 per cent of the basin's total storage and maintains flow at Berlin, New Hampshire, between approximately 1,550 and 2,500 cfs. These dams affect the water quality by lowering the stream velocities, decreasing reaeration and permitting the creation of benthal deposits in the impoundments. Immediately above the Lewiston-Auburn area, increased water depths and benthal deposits result in water quality conditions below the minimum water use standard of the New England Interstate Water Pollution Control Commission. This reach, as well as a reach in the vicinity of Jay, is considered to create nuisance conditions.

High organic loads introduced by industrial activities of pulp and paper mills seriously degrade the water quality prior to the river's passage through the more densely populated area. Over 60 per cent of the population is located in and downstream of the Lewiston-Auburn area.

Present Water Quality

The present quality of the Androscoggin River is shown in Figure V-2, and the waste contributors affecting this quality are shown in Table V-3. The quality shown was determined after analysis of data from various sources including the classification reports of the Androscoggin River prepared by the states of Maine and New Hampshire. Because of differences between the classification systems of the respective states and for the sake of uniformity, an attempt has been made to show the quality of the waters in relation to the New England Interstate Water Pollution Control Commission Standards of Water Quality dated September 14, 1966. These standards of quality are shown in Appendix A.

From its headwaters to Berlin, New Hampshire, the Androscoggin River and its interstate tributaries are free of major pollution sources. At Berlin and Gorham, New Hampshire, the Brown Paper Company contributes wastes amounting to about 30 per cent of the total BOD discharged to the Androscoggin. These wastes, in addition to the municipal wastes of Berlin and Gorham, significantly degrade the river's quality in a reach extending from Berlin to Gilead, Maine. The wastes discharged at Berlin and Gorham lower the dissolved oxygen concentration from values greater than 7 mg/l just above Berlin to a value slightly over 4 mg/l just below the State line.

From Gilead to about Rumford, the stream is in a state of recovery with dissolved oxygen concentrations rising to above 5 mg/l. At Rumford, wastes discharged by the Oxford Paper Company and the municipal wastes of Rumford begin to deplete the available oxygen. At Jay, an impoundment receives the stream in a condition of significant oxygen depletion. Reduced reaeration, presence of benthal deposits, and discharges from a plant of the International Paper Company all contribute to the reduction of oxygen to levels sufficiently low to create nuisance conditions. Dissolved oxygen concentrations in this reach are less than 1 mg/l. These nuisance conditions are sustained essentially down to the Lewiston-Auburn area by wastes discharged by mills of the International Paper Company at Chisholm and Livermore Falls.

Through the metropolitan Lewiston-Auburn area, the river shows signs of partial recovery, however, the municipal and industrial waste loads from Lewiston-Auburn and the significant pollution of the Little Androscoggin River combine to again degrade the stream to Class D. At Lisbon, the river begins recovery even though sizeable industrial wastes are discharged here. This recovery to Class C continues down to the zone of tidal influence near Brunswick.

The pollution of the Androscoggin precludes or impairs potential use of the water for development as a public water supply, general recreation, development as industrial supplies requiring a higher quality than that available, propagation of fish, passage of anadramous fish, livestock watering, and the harvesting of shellfish from the Merrymeeting Bay area.

Table V-3

ANDROSCOGGIN RIVER BASIN

Androscoggin River

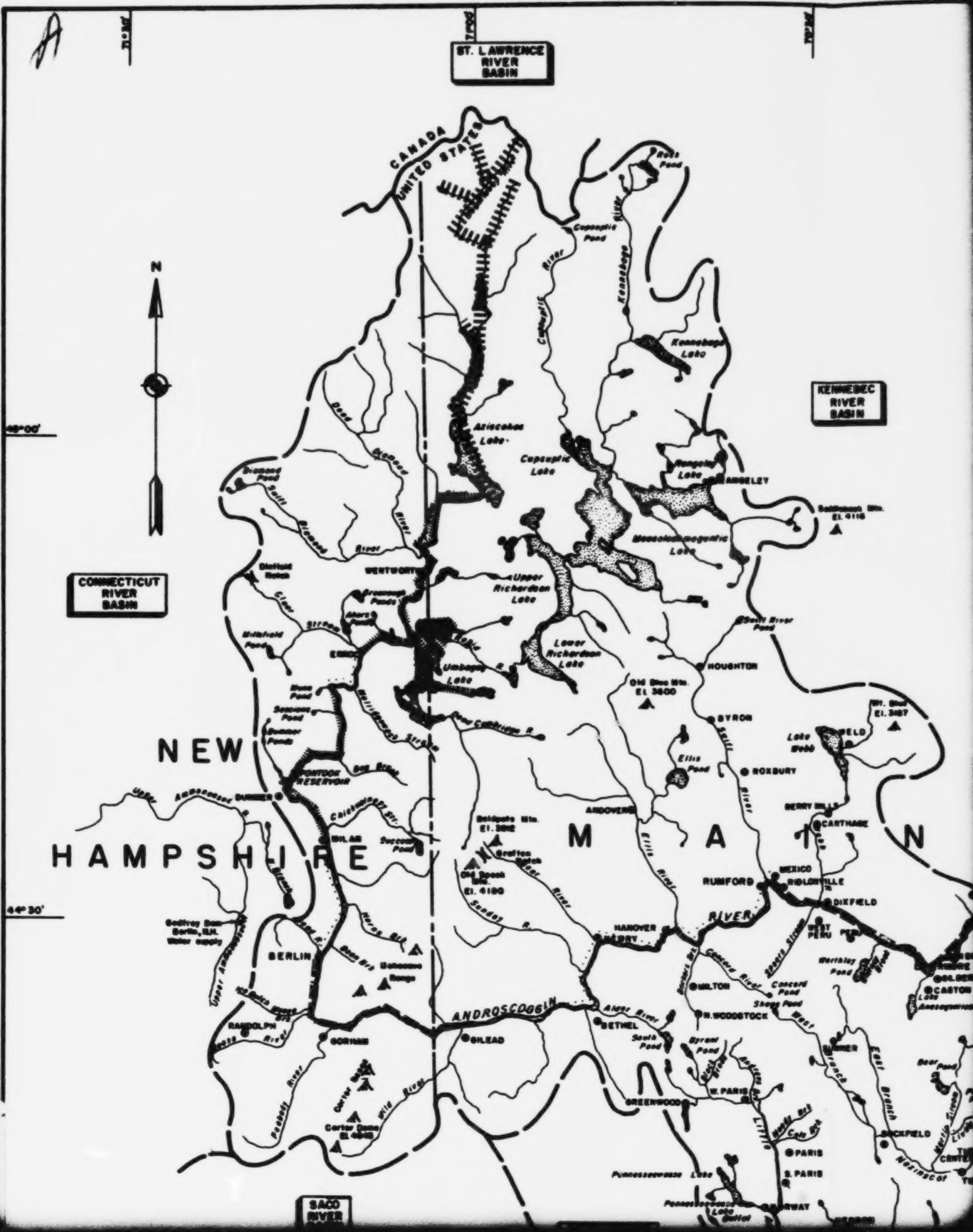
Sources of Pollution

Source[1]	River Mile	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treat.	Waste Flow, Mgd.	Waste Load, P.E. of BOD
Berlin, N. H. (M)	130.7	17,821	15,000	Municipal	None	1.6	15,000
Brown Co. (I)	130.7		3,850	Pulp & Paper	"	55.6	325,000
Gorham, N. H. (M)	130.4	3,039	2,500	Municipal	"	.28	2,500
Brown Co. (I)	130.4		2	Paper	"	2	2
Bethel, Me. (M)	109.4	2,408	1,200	Municipal	"	.17	1,800
Rumford, Me. (M)	86.0	10,005	8,000	Municipal	"	.49	9,000
Oxford Paper Co. (I)	86.0		Undet.	Pulp & Paper	"	43.8	393,000
Mexico, Me. (M)	86.0	3,941	3,000	Municipal	"	.22	4,000
Dixfield, Me. (M)	82.0	1,298	1,200	Municipal	"	.15	2,000
Jay, Me.							
Jay Village (M)	Undet.	Undet.	Undet.	Municipal	"	Undet.	Undet.
Internat'l Paper Co. (I)	"		"	Pulp & Paper	"	3	163,000
Chisholm (M)	"	"	"	Municipal	"	Undet.	Undet.
Internat'l Paper Co. (I)	"		"	Pulp & Paper	"	7.6	34,000
Livermore Falls, Me. (M)	61.8	3,343	2,600	Municipal	"	.25	2,600
Internat'l Paper Co. (I)	61.8		Undet.	Pulp & Paper	"	3	3

Table V-3 (Continued)

Source[1]	River Mile	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treat.	Waste Flow, Mgd.	Waste Load, P.E. of BOD
Lewiston, Me.							
Bates Mfg. Co. (I)	30.8		Undet.	Textile	None	.42	15,400
Peperell Mfg. Co. (I)	30.8		Undet.	Textile	"	.41	16,600
Lewiston, Me. (M)	28.8	40,804	31,000	Municipal	4	4.8	33,000
Auburn, Me. (M)	28.8	24,449	15,220	Municipal	4	1.6	17,800
Lisbon, Me. (M)	17.7	5,042	2,200	Municipal	None	.29	2,200
Lisbon Weaving Coop. (I)	16.0		Undet.	Textile	"	.36	13,500
U. S. Gypsum Co. (I)	15.7		Undet.	Ground Wood	"	1.73	38,300
Brunswick, Me.							
Pejepscot Paper Co. (I)	12.7		Undet.	Pulp & Paper	"	3.3	35,200
Topsham, Me. (M)	8.4	3,818	Undet.	Municipal	"	.22	1,800
Air Force Station (F)		Undet.	Undet.	Municipal	Primary	.08	Undet.
Brunswick, Me. (M)	8.0	15,797	14,500	Municipal	None[5]	.75	15,000
Naval Air Station (F)		Undet.	Undet.	Municipal	Primary	.47	Undet.

1. Parenthetical M, I and F following the listed waste source, indicate municipal or industrial sources, respectively.
2. Included in data of Brown Company at Berlin.
3. Included in data of International Paper Company at Chisholm.
4. Stabilization Ponds, serving a portion of the population, are under construction.
5. Primary Plant under construction.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Dead Diamond River
Aziscohos Lake
Cupsuptic Lake
Rangeley Lake
RANGELEY
Saddleback Mtn. El. 4116
Diamond Pond
Swift Diamond River
Mooselookmeguntic Lake
Dixfield Notch
WENTWORTH
Upper Richardson Lake
CONNECTICUT RIVER BASIN
Greenough Ponds
Clear Stream
Akers Pond
Millsfield Pond
ERROL
Magalloway R.
Umbagog Lake
Lower Richardson Lake
Swift River Pond
HOUGHTON
Old Blue Mtn. El. 3600
Moose Pond
Sessions Pond
Dummer Ponds
Mollidgewock Stream
Cambridge R.
BYRON
Mt. Blue El. 3187
Lake Webb
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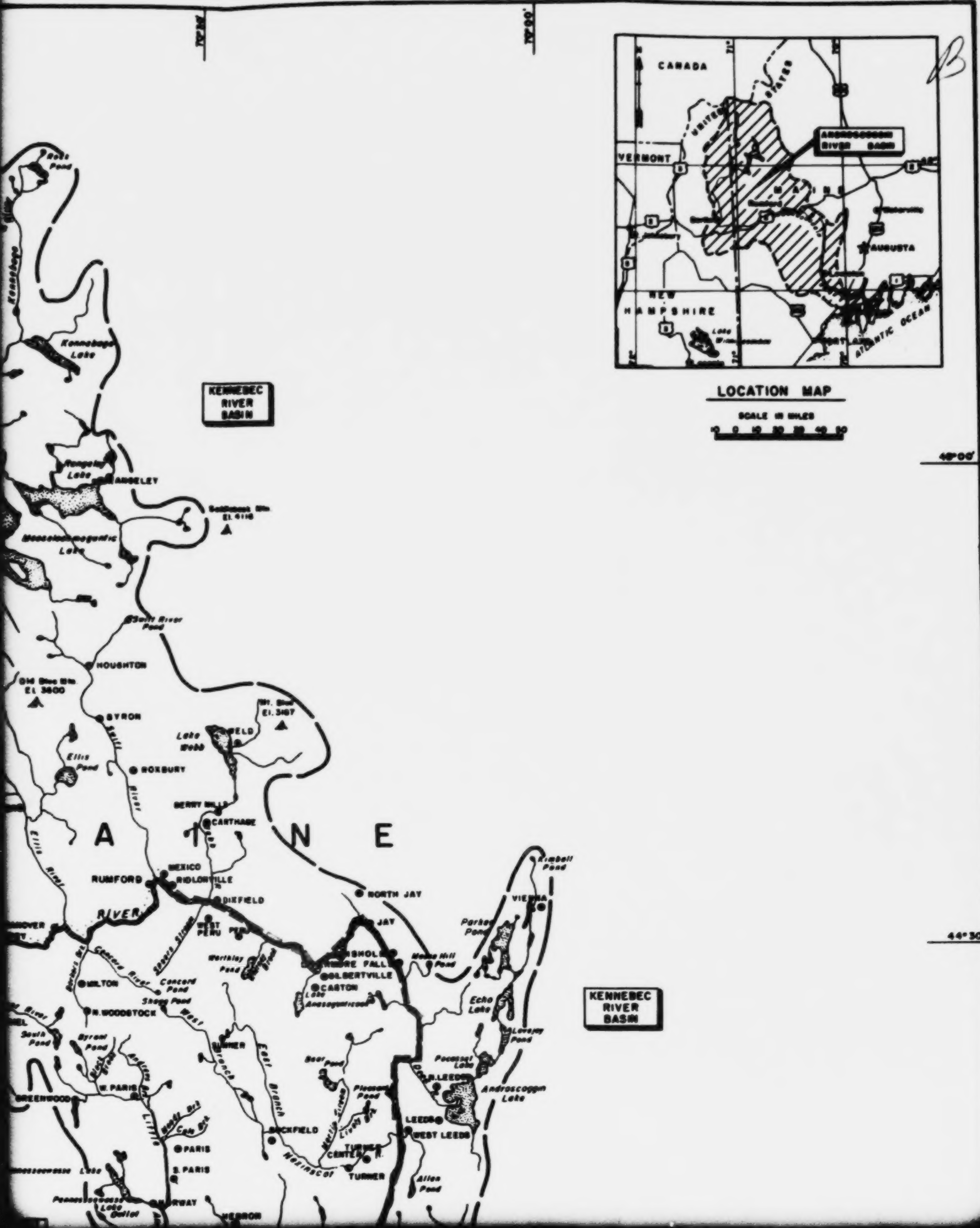
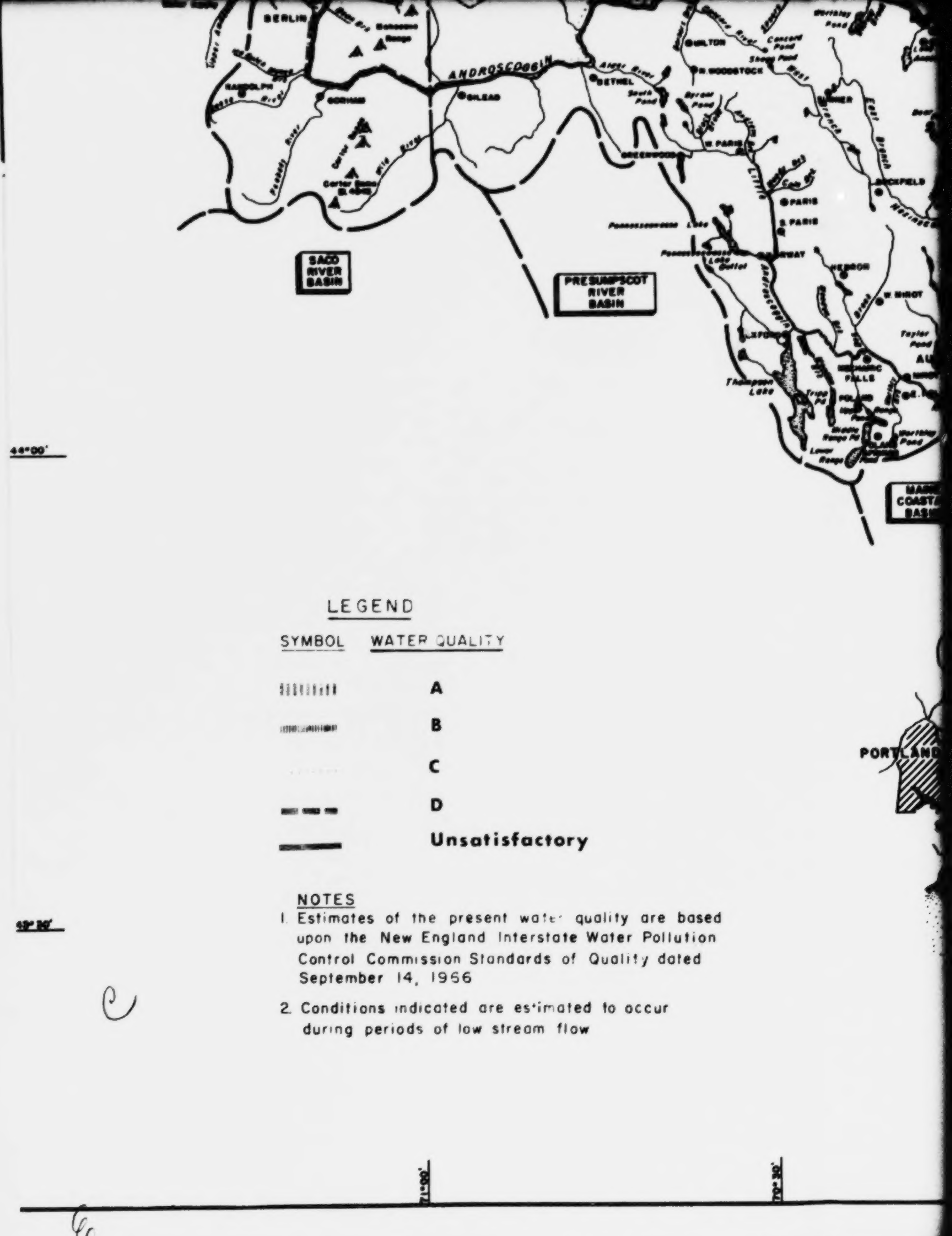
NEW
Ellis Pond
ROXBURY
Swift River
PONTOOK RESERVOIR
Bog Brook
Upper Ammonoosuc R.
DUMMER
Chickwolnepy Str.
ANDOVER
BERRY MILLS
CARTHAGE
Baldpate Mtn. El. 3812
MILAN
Success Pond
M A I N
HAMPSHIRE
Grafton Notch
Bear River
Old Speck Mtn. El. 4180
Ellis River
RUMFORD
MEXICO
RIDLONVILLE
DIXFIELD
Godfrey Dam Berlin, N.H. Water supply
Sunday R.
HANOVER
NEWRY
RIVER
Dead R.
Upper Ammonoosuc
Moose Brook
BERLIN
Peabody Brook
Mahoosuc Range
WEST PERU
PERU
Concord River
Worthley Pond
Concord Pond
MILTON
Moose Brook
ANDROSCOGGIN
Alder River
Shagg Pond
N. WOODSTOCK
RANDOLPH
Moose River
GORHAM
GILEAD
BETHEL
South Pond
Bryant Pond
West Branch
East Branch
CASTON
Lake Anasagunticook
Bear Pond
Carter Mtn.
Peabody River
Wild River
GREENWOOD
W. PARIS
Little Androscoggin
Cole Brk
BUCKFIELD
Carter Dome El. 4843
PARIS
S. PARIS
Pennesseewassee Lake
Nezinscot
Pennesseewassee Lake Outlet
NORWAY
SACO RIVER


70°30'
70°00'
CANADA
UNITED STATES
VERMONT
MAINE
ANDROSCOGGIN RIVER BASIN
AUGUSTA
NEW HAMPSHIRE
Lake Winnipesaukee
PORTLAND
ATLANTIC OCEAN
LOCATION MAP
SCALE IN MILES
10 0 10 20 30 40 50
45°00'
44°30'
KENNEBEC RIVER BASIN
KENNEBEC RIVER BASIN
Kennebago River
Kennebago Lake
Rangeley Lake
RANGELEY
Saddleback Mtn. El. 4116
Mooselookmeguntic Lake
Swift River Pond
HOUGHTON
Old Blue Mtn. El. 3600
BYRON
Swift River
Mt. Blue El. 3187
Lake Webb
WELD
Ellis Pond
ROXBURY
BERRY MILLS
CARTHAGE
M A I N E
Ellis River
MEXICO
RUMFORD
RIDLONVILLE
DIXFIELD
NORTH JAY
RIVER
JAY
WEST PERU
PERU
Concord River
Worthley Pond
CHISHOLM
RILEY FALL
GILBERTVILLE
CANTON
Lake Anasagunticook
Moose Hill Pond
Parker Pond
Kimball Pond
VIENNA
Echo Lake
Lovejoy Pond
Concord Pond
MILTON
Shagg Pond
N. WOODSTOCK
South Pond
Bryant Pond
West Branch
East Branch
SUMNER
Bear Pond
Pocasset Lake
Androscoggin Lake
N. LEEDS
Dead River
GREENWOOD
W. PARIS
Little Androscoggin River
Pleasant Pond
LEEDS
WEST LEEDS
BUCKFIELD
Nezinscot
TURNER CENTER
TURNER
PARIS
S. PARIS
Pennesseewassee Lake
NORWAY
HEBRON
Allen Pond

B


BERLIN
RANDOLPH
GORHAM
ANDROSCOGGIN
GILEAD
BETHEL
Alder River
MILTON
N. WOODSTOCK
Concord Pond
Shagg Pond
South Pond
Bryant Pond
Peabody River
Wild River
Carter Dome
GREENWOOD
W. PARIS
Little Androscoggin
PARIS
S. PARIS
NORWAY
Pennesseewassee Lake
HEBRON
W. MINOT
BUCKFIELD
OXFORD
Thompson Lake
Tripp Pd
MECHANIC FALLS
POLAND
Middle Range Pd
Lower Range Pond
Worthley Pond
Taylor Pond
SACO RIVER BASIN
PRESUMPSCOT RIVER BASIN
MAINE COASTAL BASIN
PORTLAND
44°00'
43°30'
71°00'
70°30'

LEGEND

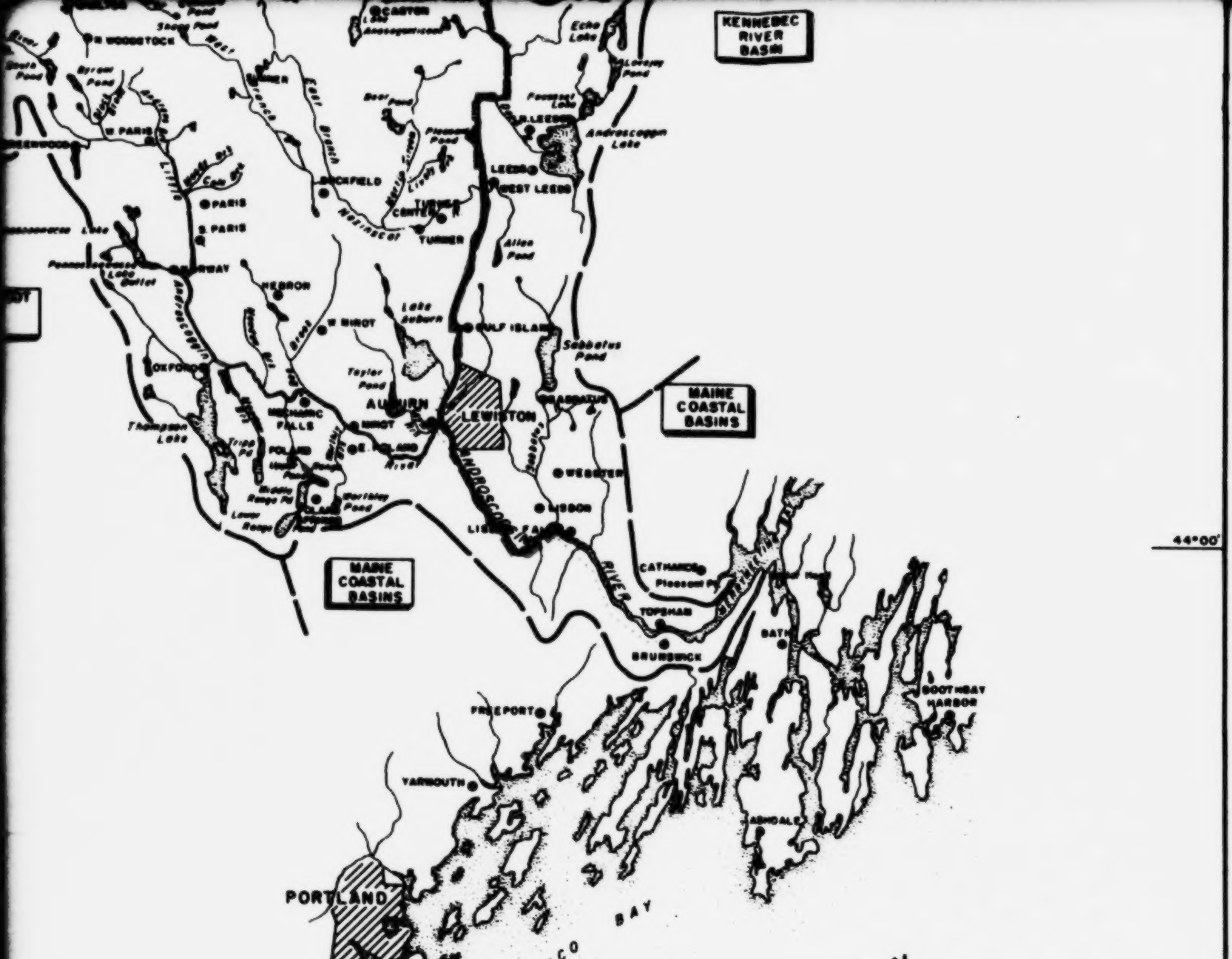
SYMBOL	WATER QUALITY
┆┆┆┆┆┆	A
┅┅┅┅	B
┈┈┈┈	C
▬ ▬ ▬	D
━━━━	Unsatisfactory

NOTES

1. Estimates of the present water quality are based upon the New England Interstate Water Pollution Control Commission Standards of Quality dated September 14, 1966
2. Conditions indicated are estimated to occur during periods of low stream flow

C

C


KENNEBEC RIVER BASIN
MAINE COASTAL BASINS
MAINE COASTAL BASINS
ANDROSCOGGIN RIVER
LEWISTON
AUBURN
PORTLAND
SO. PORTLAND
CASCO BAY
ATLANTIC OCEAN
BRUNSWICK
TOPSHAM
BATH
FREEPORT
YARMOUTH
BOOTHBAY HARBOR
LISBON
LISBON FALLS
WEBSTER
SABATTUS
Sabattus Pond
Lake Auburn
Taylor Pond
Thompson Lake
OXFORD
MECHANIC FALLS
POLAND
MINOT
HEBRON
PARIS
S. PARIS
NORWAY
BUCKFIELD
TURNER
TURNER CENTER
LEEDS
WEST LEEDS
N. LEEDS
Androscoggin Lake
Allen Pond
Echo Lake
CATHANCE
Pleasant Pd
Worthley Pond
Lower Range Pond
Middle Range Pd
Tripp Pd
Pennesseewassee Lake
W. PARIS
N. WOODSTOCK
GREENWOOD
44°00'
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70°00'
SCALE IN MILES
0
4
8
12

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Pollution
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NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM
ANDROSCOGGIN RIVER BASIN
PRESENT WATER QUALITY

D

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION BOSTON, MASS.

FIGURE V-2

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CHAPTER VI
CASCO BAY COASTAL BASIN

SUMMARY

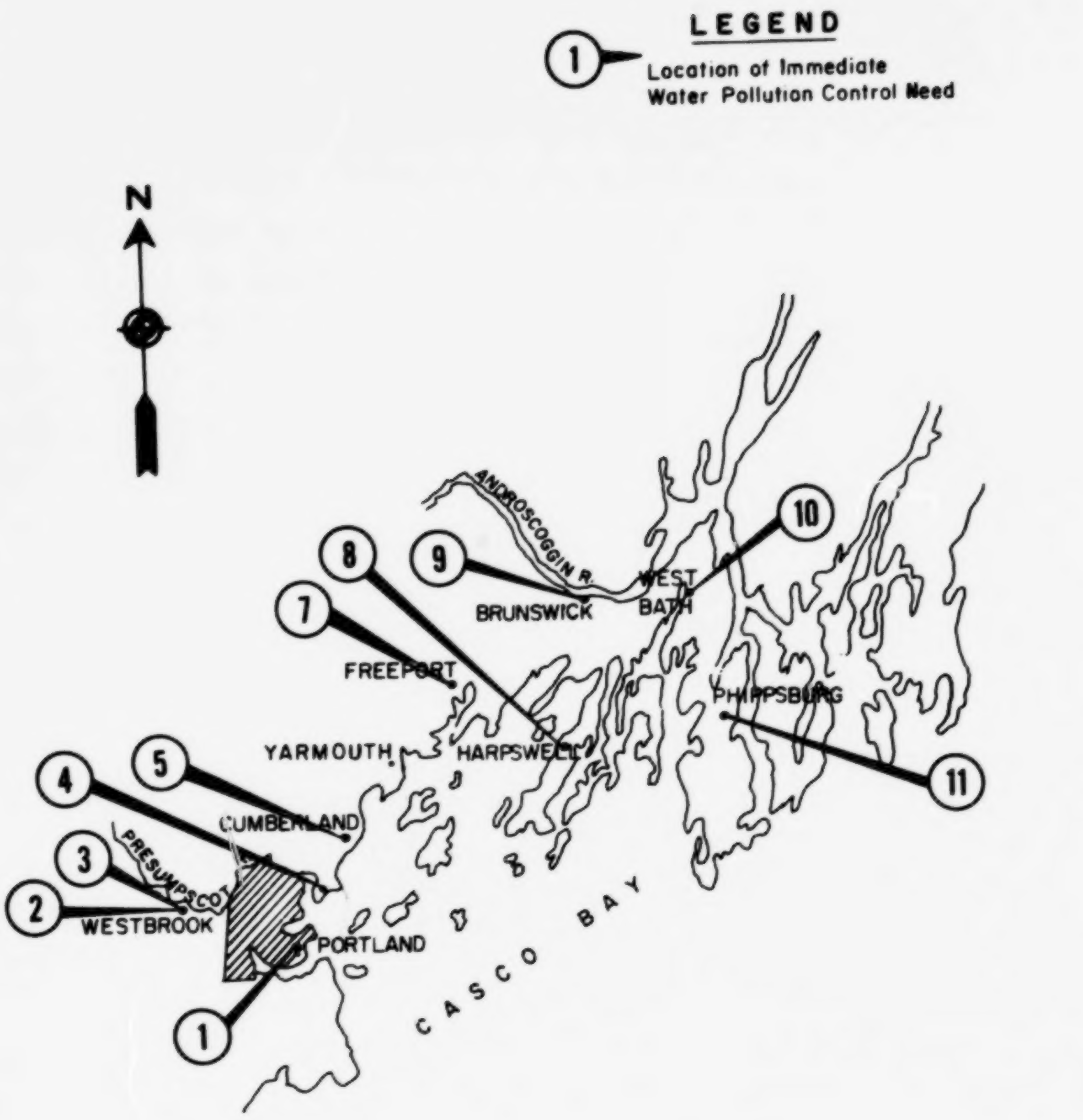
Major water quality problems of the Casco Bay Coastal Waters have threatened with closure or prohibited shellfishing and recreational activities. The total BOD discharged to the bay is approximately 352,000 P.E.

The most serious degradation occurs on the Presumpscot River estuary. The major contributor to the pollution of the tidal section of the Presumpscot River is the S. D. Warren Paper Company at Westbrook, although it is located above the zone of tidal influence. The paper company contributes about 90 per cent of the total BOD load discharged to the bay. Additional wastes affecting the water quality of the estuary are discharged by Westbrook, Portland and Falmouth. As a result of this pollution, clamming areas and sandy beaches have been closed along the Falmouth and Portland shores.

Untreated domestic and industrial wastes discharged at Yarmouth and domestic wastes discharged at West Bath, Brunswick and Phippsburg have been responsible for closing productive clam flats in these areas. To reopen the clam flats and to prevent further clamming areas from being closed, abatement programs must be initiated by the above communities.

Evaluation of water quality problem areas indicates that immediate pollution control action should be directed toward sources that affect recreational and shellfishing uses. Pollution abatement is estimated to require a minimum expenditure of over $15,000,000 by the cities, towns, and industries discharging wastes that degrade the quality of Casco Bay.

Immediate water pollution control needs are summarized in Table VI-1 and shown in the accompanying map, Figure VI-1. The priorities recommended were chosen on the basis of their relative importance in upgrading large reaches of these coastal waters, however, these priorities are not intended to prevent or delay the initiation or completion of independent pollution control programs by either municipalities or industries located on the Casco Bay Coastal Waters of Maine.


LEGEND
①
Location of Immediate Water Pollution Control Need
N
ANDROSCOGGIN R.
PRESUMPSCOT
WESTBROOK
PORTLAND
CUMBERLAND
YARMOUTH
FREEPORT
HARPSWELL
BRUNSWICK
WEST BATH
PHIPPSBURG
CASCO BAY
1
2
3
4
5
7
8
9
10
11
SCALE IN MILES
0 4 8 12

NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM

CASCO BAY COASTAL WATERS

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION BOSTON, MASS.

FIGURE VI-1

Table VI-1

CASCO BAY COASTAL WATERS

Summary of Immediate Water Pollution Control Needs

Location Map Key No.	Responsibility	Need	Priority[1]
3	S. D. Warren Co., Westbrook, Me.	Secondary Waste Treatment	A
2	Westbrook, Me.	"	A
1	Portland, Me.	"	A
4	Falmouth, Me.	"	A
5	Cumberland, Me.	"	B
7	Freeport, Me.	"	B
9	Brunswick, Me. (coastal sources)	""	B
8	Harpswell, Me.	"	B
10	West Bath, Me.	"	B
11	Phippsburg, Me.	"	B

---

[1] Priorities of actions are divided into two categories based on their impact on water quality improvements.

IMMEDIATE POLLUTION CONTROL NEEDS

The Presumpscot River estuary is seriously degraded, approaching nuisance conditions, primarily as the result of the untreated waste discharges of the S. D. Warren Paper Company at Westbrook. Westbrook, Portland and Falmouth also discharge significant amounts of untreated wastes to the river and estuary. Therefore, to abate the degraded conditions in this section of Casco Bay, immediate abatement of the above waste discharges by secondary treatment or its equivalent is recommended. Implementation of recommended pollution control measures would result in an estimated improvement in water quality of the Presumpscot River estuary to Class C[1], and portions of the Falmouth coast to Class B. Upgrading the estuary and coastline would enhance the recreational value of the area, and boating, fishing and swimming along the Presumpscot estuary and Falmouth coast would again become major activities.

At present a secondary treatment plant is being constructed at Yarmouth which will effectively eliminate the discharge of wastes in that area. The Class C waters at Yarmouth are caused chiefly by untreated waste discharges from the town. Abatement of this source of pollution will upgrade this section of the coast to Class B. Following abatement, a large number of productive clam flats could be reopened in Maine.

Further abatement measures are recommended for Cumberland, Brunswick, Freeport, Harpswell, West Bath and Phippsburg. Pollution abatement by these communities would allow clamming areas, closed because of untreated and beaches located adjacent to the towns of Cumberland, Freeport, Harpswell and Phippsburg would be upgraded to a quality more beneficial to health.

---

[1] Based upon New England Interstate Water Pollution Control Commission Water Quality Standards shown in Appendix A.

COSTS

Estimates of costs for recommended pollution abatement measures have been based on provisions for secondary treatment, including disinfection, of all waste discharges. The estimates shown in Table VI-2 were prepared by the FWPCA utilizing costs obtained from consulting engineering and state classification reports, state agencies, and generalized treatment plant cost curves. These costs have been adjusted where necessary. These estimates serve only to indicate the order of magnitude of financial investment needed to abate pollution on the interstate streams of a basin and do not replace the more detailed estimates developed as a result of engineering studies for specific municipalities or industries. Pollution abatement facilities for sources discharging wastes to the interstate waters of the Casco Bay Coastal Basin will require a minimum expenditure of approximately $15,000,000.

Table VI-2
CASCO BAY COASTAL WATERS
Recommended Abatement Measures and Estimated Costs

Source[1]	Recommended Treatment	Estimated Cost[2]	Remarks
Westbrook (M)*	Secondary	$ 2,900,000	*These sources do not discharge directly to the Casco Bay Coastal Water, however, they are the sources affecting these waters. Westbrook is constructing stabilization ponds for municipal wastes.
S. D. Warren Co. (I)*	"	8,300,000	
Portland (M)*	"	*	*Included in the proposed Portland Sewerage System discussed in the Saco River Basin Report, **Chapter VII.**
Falmouth (M)	"	2,790,000*	*Cost of construction of sewerage system and transporting wastes to Portland's proposed treatment plant.
Freeport (M)	"	230,000	
Cumberland (M) Brunswick (M) Harpswell (M) West Bath (M) Phippsburg (M)	"	1,011,000*	*Estimated cumulative treatment cost of five towns.
Total		$16,105,000	

---

1. Parenthetical M and I following the listed waste source indicate municipal or industrial sources, respectively.
2. Estimated costs for municipal waste sources include costs for waste treatment facilities and interceptors, where required. Estimated costs for industrial waste sources include costs for waste treatment facilities only.

RECENT PROGRESS IN POLLUTION CONTROL

The Maine Water Improvement Commission has always encouraged communities and industries in the State to develop waste treatment. In 1965, construction of stabilization ponds was started at Westbrook to treat the municipal wastes from a housing development; in 1966 the S.D. Warren Company at Westbrook had detailed engineering waste treatment studies conducted. A secondary treatment plant is scheduled to be completed at Yarmouth during the summer of 1967.

The State of Maine has provided that the Water Improvement Commission make recommendations to each legislature with respect to the classification of the coastal waters based on standards of quality and use. In this respect, the Maine Legislature has already adopted classification standards for the Casco Bay Coastal Waters.

Within the last five years, the FWPCA has authorized grants-in-aid for the construction of secondary treatment facilities at municipalities along the coastal waters amounting to approximately $816,000. These facilities are presently under construction at Westbrook and Yarmouth. The FWPCA currently has no applications for grants under consideration for the construction of pollution abatement facilities along Casco Bay. The State of Maine also provides funds for grant-in-aid programs amounting to 30 per cent of the project cost.

BACKGROUND FOR RECOMMENDATIONS

Pertinent Basin Characteristics

The Casco Bay Coastal Waters cover the Maine Coast from the Presumpscot River estuary to the mouth of the Kennebec River. The area is generally of low relief with low, rolling hills rising above braod, flat coastal plains. Except for the Portland-Falmouth area, Casco Bay is not heavily populated, and is comprised mainly of small recreational and fishing communities. The bay is highly productive in both quahog and soft-shelled clams, as well as lobstering and fishing. Industrialization is not of major significance.

Present Water Quality

The present quality of the Casco Bay Coastal Waters is shown in Figure VI-2, and the waste contributors affecting this quality are shown in Table VI-3. The quality as shown was determined after analysis of data from various sources including classification reports prepared by the State of Maine. The quality of the waters are based upon the New England Interstate Water Pollution Control Commission Standards of Water Quality dated September 14, 1966, as shown in Appendix A.

The Presumpscot River estuary is the most seriously degraded portion of the Bay. Untreated waste discharges of the S. D. Warren Paper Company above the zone of tidal influence at Westbrook are the chief cause of the estuary's Class D condition. Additional untreated wastes discharged by Westbrook, Portland and Falmouth add to the pollution of the estuary. Median bacterial concentrations vary from approximately 9,300 col/100ml below the dam at Presumpscot Falls (beginning of tidal influence) to 3,900 at the mouth of the Presumpscot River estuary.

Other coastal waters where the median bacterial loadings are consistently greater than 70 col/100ml, above which limit the taking of market shellfish is not recommended, occur near the coastal communities. The town of Yarmouth at present discharges wastes to coastal streams resulting in median coliform levels greater than 10,000 col/100 ml. Clamming areas along the shores of Yarmouth, Falmouth, West Bath, Brunswick and Phippsburg have been closed due to the pollution from these communities' untreated wastes.

Table VI-3

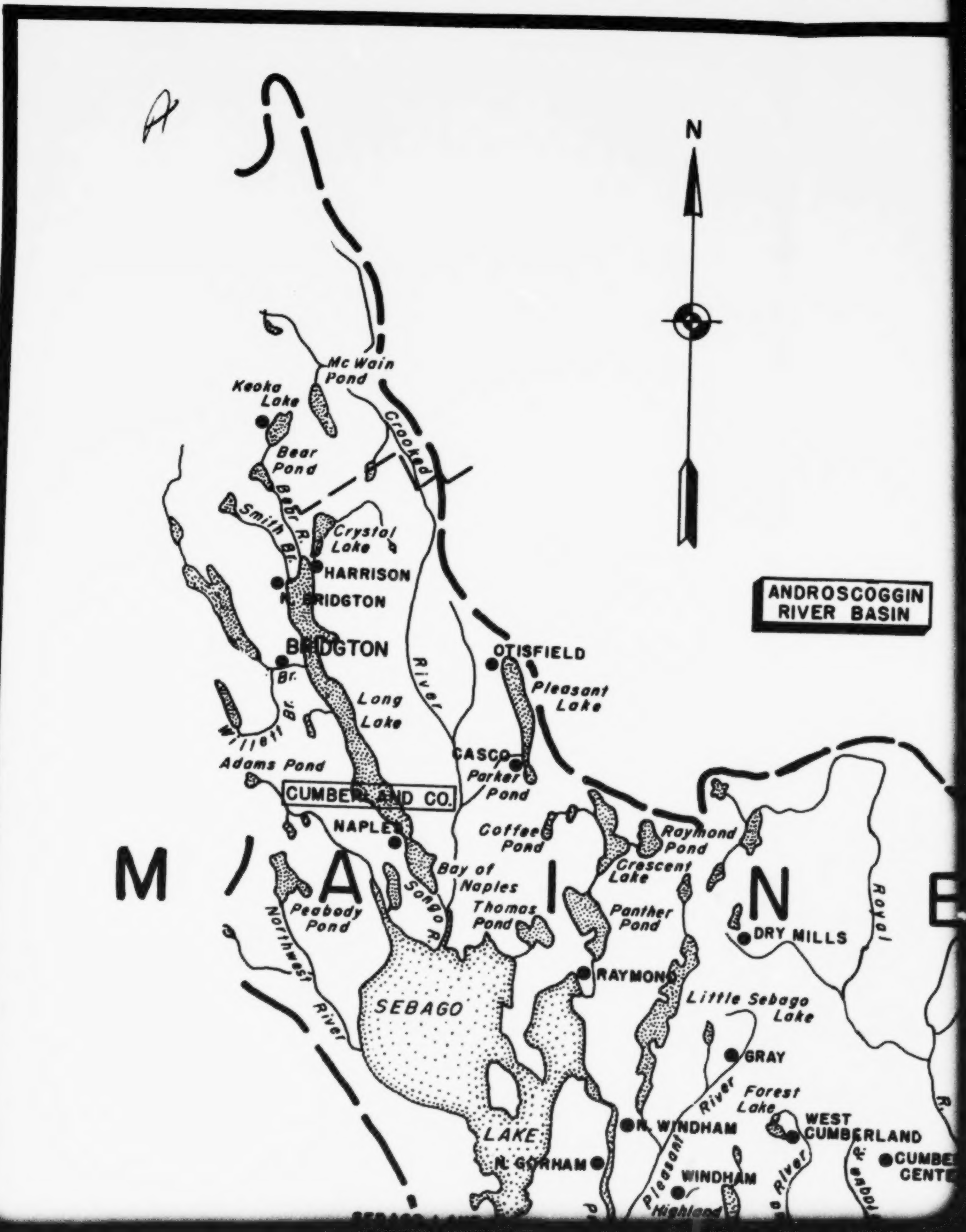
CASCO BAY COASTAL WATERS

Sources of Pollution

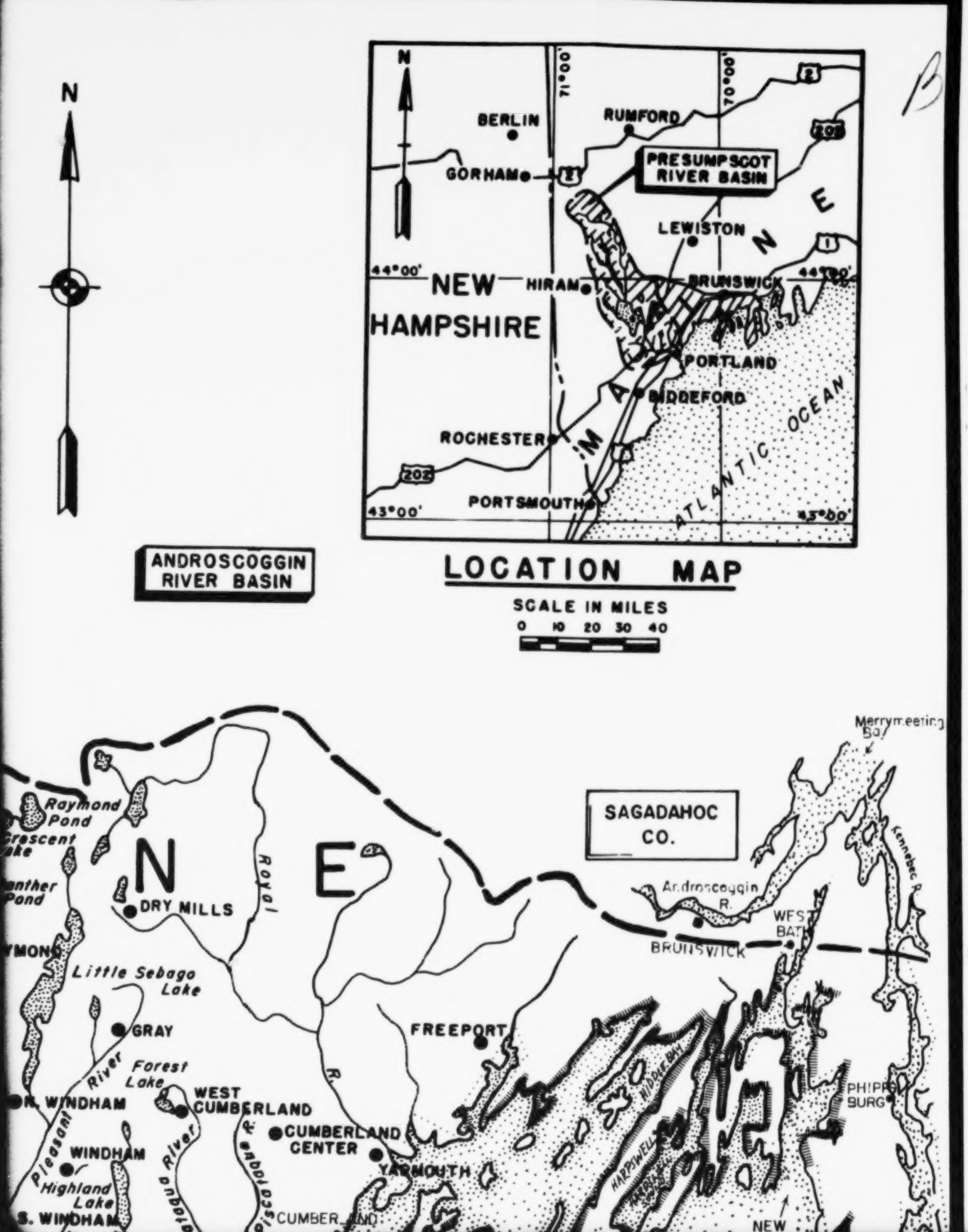
Source[1]	Coastal Water	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treat.	Waste Flow, Mgd.	Waste Load, P.E. of BOD
Westbrook (M)	Presumpscot R.	13,820	10,000	Municipal	None[2]	Undet.	10,000
S. D. Warren Co. (I)	"		2,700	Paper	"	"	310,000
Portland (M)	"	72,566	5,000	Municipal	"	"	5,000
Yarmouth (M)	Royal R.	2,913	1,500	Municipal	None[3]	"	2,500
Freeport (M)	Atlantic O.	4,055	2,000	Municipal	Primary	Undet.	2,500
Falmouth	Atlantic O.	5,976[5]	None				Undet.
Cumberland	Atlantic O.	2,765[5]	"				"
Brunswick	Middle Bay Cove	700[4,5]	"				"
Harpswell	Middle Bay	2,032[5]	"				"
West Bath	New Meadow R.	766[5]	"				"
Phippsburg	Kennebec R.	1,121[5]	"				"
		19,660[5]	No municipal system; many individual outlets				

---

1. Parenthetical M and I following the listed waste source indicate municipal or industrial sources, respectively.
2. Stabilization ponds for municipal wastes are under construction.
3. Secondary treatment plant under construction.
4. Not total population of Brunswick; population affecting coastal waters only.
5. Included in total of 19,660.


N
ANDROSCOGGIN RIVER BASIN
Mc Wain Pond
Keoka Lake
Bear Pond
Crooked
Bear R.
Smith Br.
Crystal Lake
HARRISON
N. BRIDGTON
BRIDGTON
Br.
Willett Br.
Long Lake
River
OTISFIELD
Pleasant Lake
CASCO
Parker Pond
Adams Pond
CUMBERLAND CO.
NAPLES
Coffee Pond
Raymond Pond
Crescent Lake
Bay of Naples
Songo R.
Thomas Pond
Panther Pond
Peabody Pond
Northwest River
M A I N E
DRY MILLS
Royal
RAYMOND
SEBAGO
LAKE
Little Sebago Lake
GRAY
Forest Lake
WEST CUMBERLAND
N. WINDHAM
N. GORHAM
WINDHAM
Pleasant River
Highland
River
CUMBE
CENTE
R.

A


N
ANDROSCOGGIN RIVER BASIN
N
BERLIN
RUMFORD
2
202
GORHAM
2
PRESUMPSCOT RIVER BASIN
E
LEWISTON
N
1
44°00'
44°00'
NEW HAMPSHIRE
HIRAM
BRUNSWICK
71°00'
70°00'
PORTLAND
BIDDEFORD
MAINE
ROCHESTER
ATLANTIC OCEAN
202
PORTSMOUTH
43°00'
43°00'
LOCATION MAP
SCALE IN MILES
0 10 20 30 40
Merrymeeting Bay
Raymond Pond
Crescent Lake
Panther Pond
RAYMOND
N
E
DRY MILLS
Royal
SAGADAHOC CO.
Kennebec R.
Androscoggin R.
WEST BATH
BRUNSWICK
Little Sebago Lake
GRAY
FREEPORT
Pleasant River
Forest Lake
N. WINDHAM
WEST CUMBERLAND
R.
CUMBERLAND CENTER
WINDHAM
Highland Lake
Presumpscot River
Piscataqua R.
YARMOUTH
MIDDLE BAY
HARPSWELL
HARPSWELL SOUND
PHIPPSBURG
S. WINDHAM
CUMBERLAND
NEW

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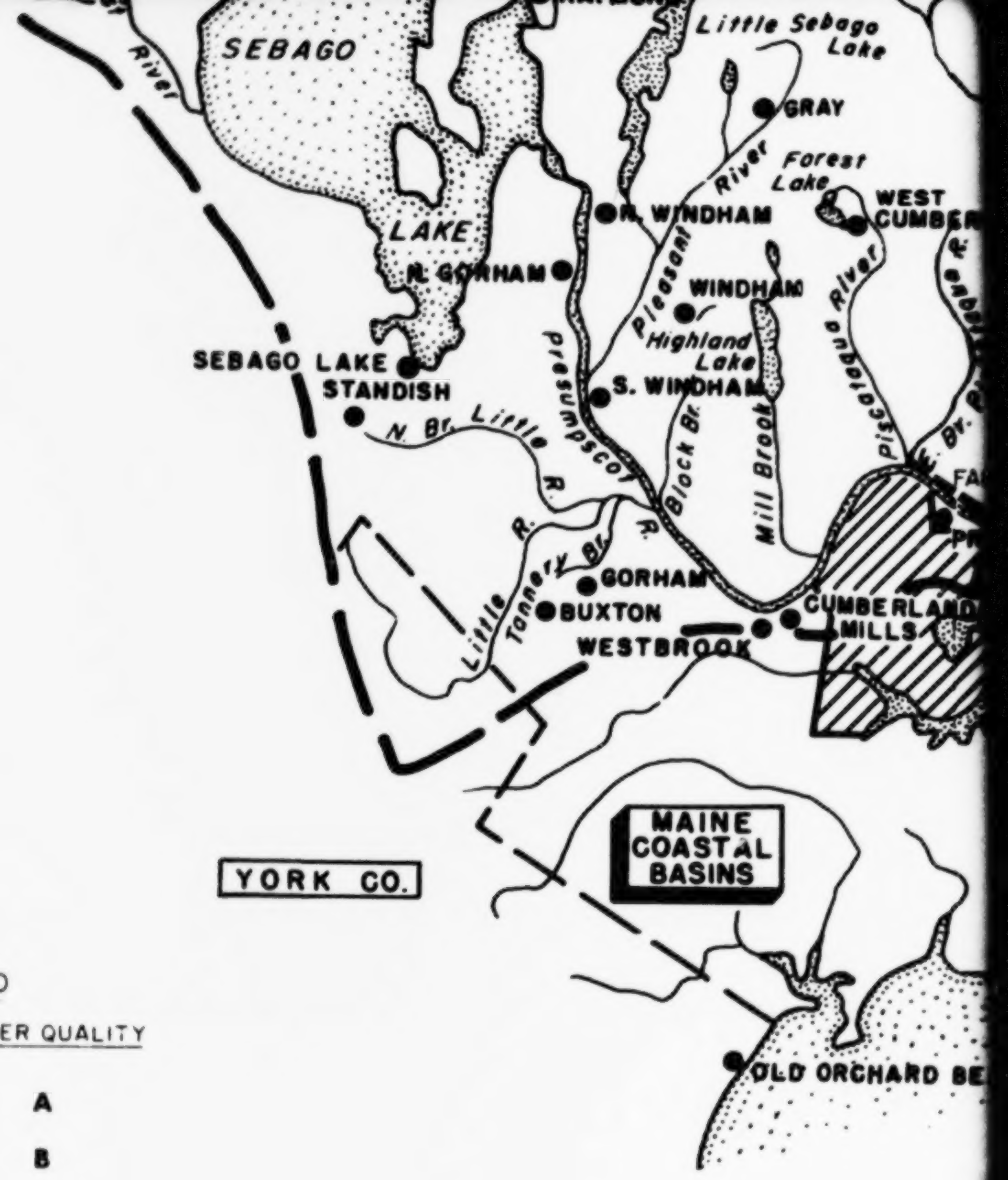
River
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Little Sebago Lake
GRAY
Forest Lake
Pleasant River
N. WINDHAM
WEST CUMBER
N. GORHAM
WINDHAM
Highland Lake
Piscataqua River
SEBAGO LAKE
STANDISH
Presumpscot R.
S. WINDHAM
N. Br. Little R.
Black Br.
Mill Brook
Little R.
Tannery Br.
GORHAM
BUXTON
WESTBROOK
CUMBERLAND MILLS
MAINE COASTAL BASINS
YORK CO.
OLD ORCHARD BE

LEGEND

SYMBOL	WATER QUALITY
IIIIIIIII	A
▬▬	B
	C
▬ ▬ ▬	D
▬▬	Unsatisfactory

NOTES

1. Estimates of the present water quality are based upon the New England Interstate Water Pollution Control Commission Standards of Quality dated September 14, 1966
2. Conditions indicated are estimated to occur during periods of low stream flow

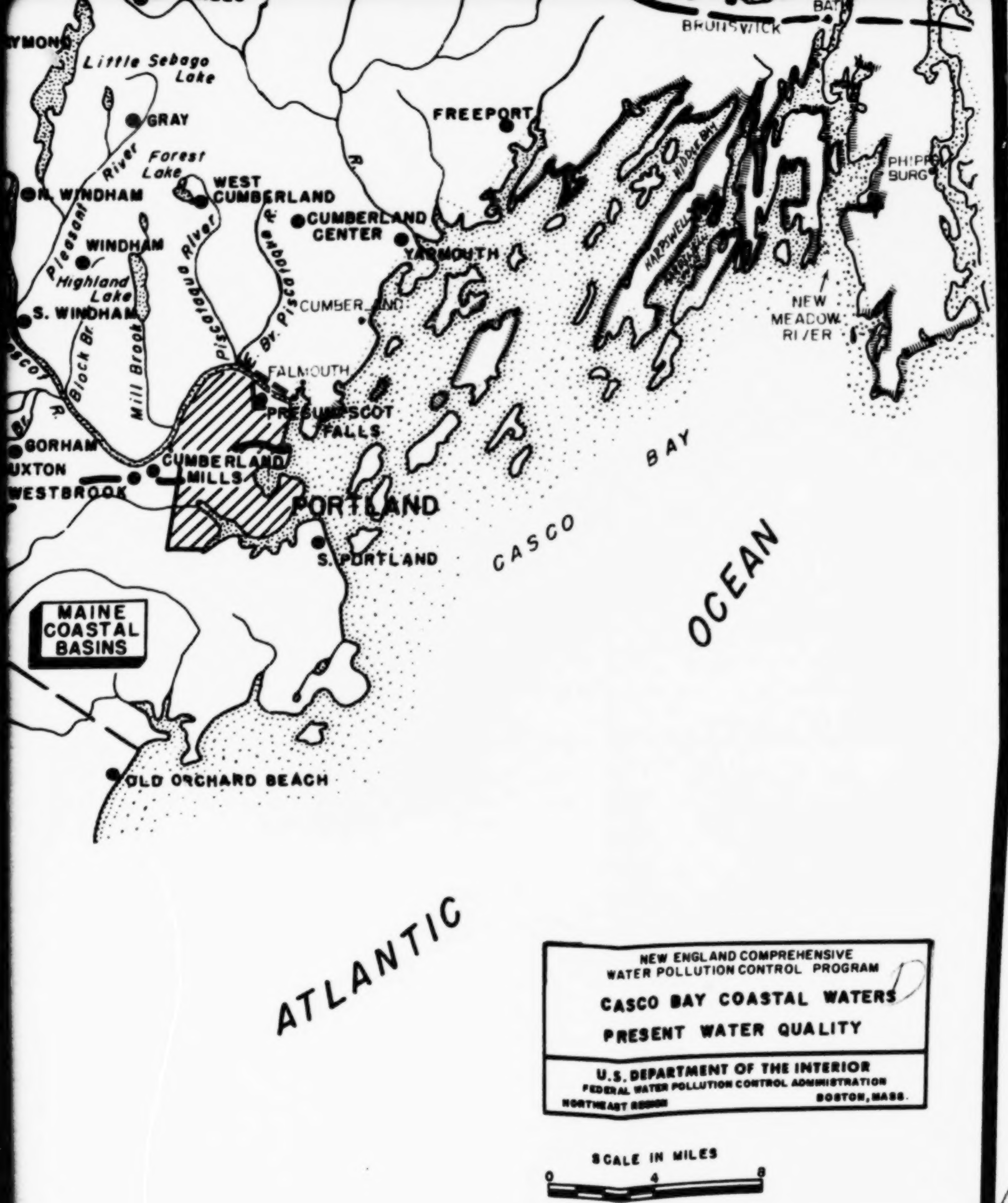
BRUNSWICK
BATH
YMOND
Little Sebago Lake
GRAY
FREEPORT
Forest Lake
Pleasant River
N. WINDHAM
WEST CUMBERLAND
CUMBERLAND CENTER
WINDHAM
Piscataqua River
Br. Piscataqua R.
YARMOUTH
Highland Lake
CUMBERLAND
S. WINDHAM
Block Br.
Mill Brook
FALMOUTH
PRESUMPSCOT FALLS
R.
GORHAM
UXTON
CUMBERLAND MILLS
WESTBROOK
PORTLAND
S. PORTLAND
CASCO BAY
OCEAN
ATLANTIC
HARPSWELL
MIDDLE BAY
PHIPPSBURG
NEW MEADOW RIVER
MAINE COASTAL BASINS
OLD ORCHARD BEACH
NEW ENGLAND COMPREHENSIVE WATER POLLUTION CONTROL PROGRAM
CASCO BAY COASTAL WATERS
PRESENT WATER QUALITY
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION
BOSTON, MASS.
SCALE IN MILES
0
4
8

FIGURE VI-2

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CHAPTER VII
SACO RIVER BASIN

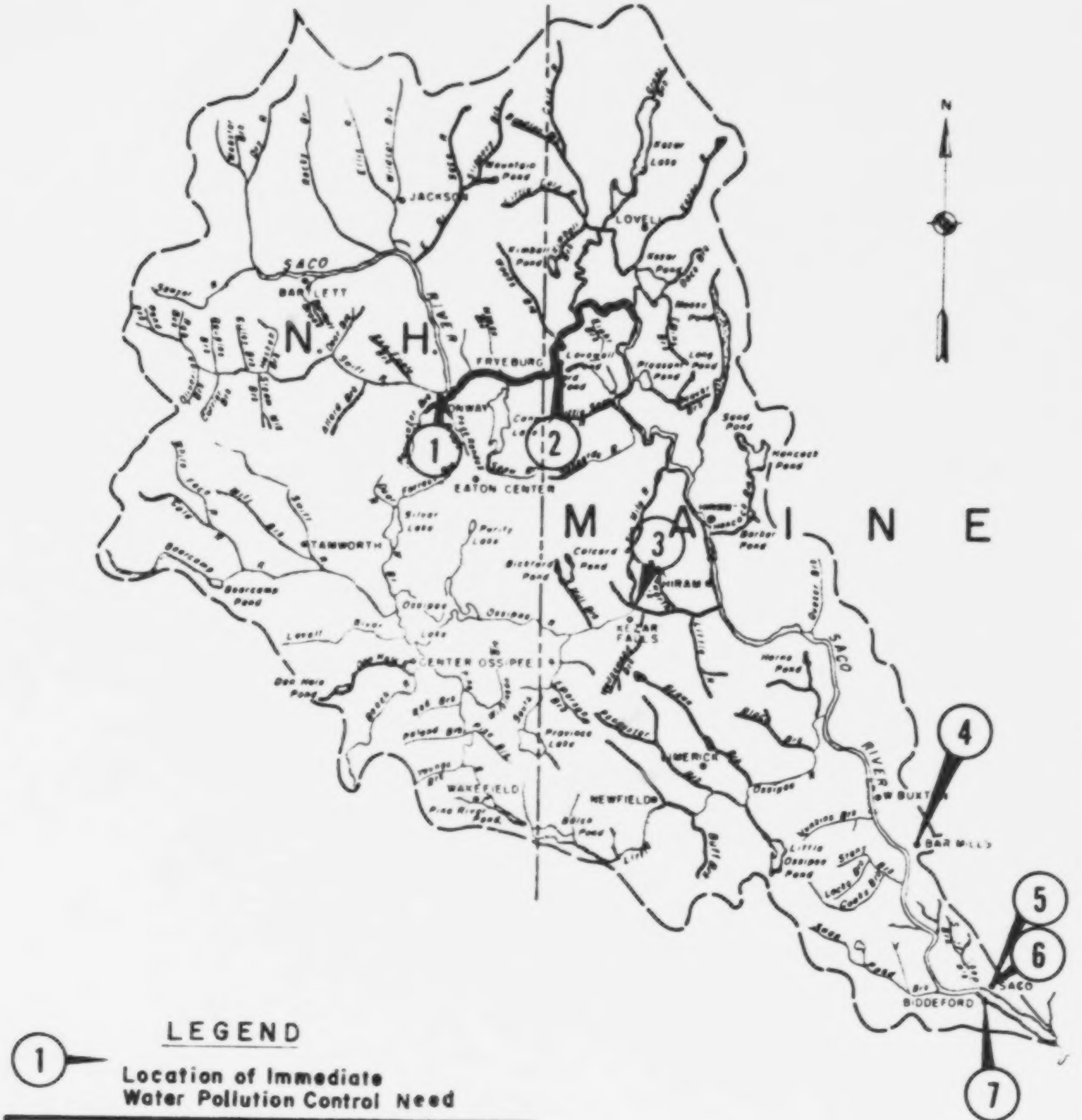
SUMMARY

Major water quality problems of the interstate waters in the Saco River Basin occur along the Saco River at Fryeburg, Maine, between Bar Mills, Maine, and the Atlantic Ocean, and along the Ossipee River at Kezar Falls, Maine. Water quality degradation along these reaches is caused by untreated waste discharges from industries and municipalities. The total BOD discharged to the Saco and Ossipee Rivers is estimated at greater than 111,000 P.E.

Industrial operations, tanning, textile, fiberboard manufacture and seasonal food processing, contribute over 90 per cent of the total BOD load discharged to the rivers. The largest of these industrial sources is the Saco Tanning Corporation in Saco, Maine.

The major sources of municipal pollution along the Saco River are Conway, New Hampshire, and Saco, Maine.

Pollution control is required at major industrialization sites and population centers to achieve adequate levels of water quality. Pollution abatement will require an estimated expenditure of over $7,000,000 by the cities, towns and industries discharging wastes directly to the Saco and Ossipee Rivers. Immediate water pollution control needs are summarized in Table VII-1, and pinpointed on the accompanying map, Figure VII-1.


N
N. H.
M A I N E
SACO
RIVER
SACO RIVER
JACKSON
BARTLETT
FRYEBURG
CONWAY
EATON CENTER
LOVELL
TAMWORTH
CENTER OSSIPEE
HIRAM
KEZAR FALLS
LIMERICK
NEWFIELD
WAKEFIELD
W BUXTON
BAR MILLS
SACO
BIDDEFORD
Ossipee
Kezar Lake
Silver Lake
Purity Lake
Bickford Pond
Colcord Pond
Province Lake
Little Ossipee Pond
1
2
3
4
5
6
7
LEGEND
1
Location of Immediate Water Pollution Control Need

NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM
SACO RIVER BASIN
SACO and OSSIPEE RIVERS

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION BOSTON, MASS.

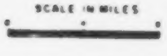

SCALE IN MILES

FIGURE VII-1

Table VII-1

SACO RIVER BASIN

Saco and Ossipee Rivers

Summary of Immediate Water Pollution Control Needs

Location Map Key No.	Responsibility	Need	Priority[1]
6	Saco Tanning Corp., Saco, Maine	Secondary Waste Treatment	A
5	Saco, Maine	"	A
7	Pepperell Mfg. Co., Biddeford, Maine	"	A
2	Burnham & Morrill Cannery Fryeburg, Maine	"	B
4	Rogers Fibre Co., Bar Mills, Maine	"	B
3	Strafford Woolen Co., Kezar Falls, Maine	"	B
1	Conway, New Hampshire	"	C

---

1. Priorities of actions are divided into three categories based on their impact on water quality improvements.

IMMEDIATE POLLUTION CONTROL NEEDS

The large proportion of the total waste load contributed by industrial activities and cities indicates that immediate pollution abatement measures should be directed toward these sources. In view of the magnitude of the pollutional loads, secondary treatment or its equivalent is recommended.

The water quality in the section from Biddeford to the Atlantic Ocean is presently the most seriously degraded. A map showing estimated present water quality conditions is shown in Figure VII-2. The conditions in this reach stem primarily from the untreated waste discharges of the Saco Tanning Corporation and the Pepperell Manufacturing Company. The City of Saco also discharges some untreated wastes which contribute to the problem.

To improve the degraded conditions in this reach as soon as feasible, immediate abatement of wastes from the Saco Tanning Corporation, the Pepperell Manufacturing Company and the City of Saco is recommended. Implementation of these pollution control measures would result in an estimated improvement in the Saco's water quality to Class C[1] in the reach from Biddiford to the Atlantic Ocean.

Industries at Fryeburg, Bar Mills and Kezar Falls, Maine, should receive attention, following the above sources. Abatement of the wastes from the Burnham and Morrill Cannery at Fryeburg should upgrade the Saco River between Fryeburg and Fryeburg Center to Class B. The reach of the Saco between Bar Mills and Union Falls would be upgraded to Class C by controlling wastes

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1. Based on New England Interstate Water Pollution Control Commission Water Quality Standards shown in Appendix A.

from the Rogers Fibre Company at Bar Mills. Abatement of the wastes from the Strafford Woolen Company should upgrade the reach of the Ossipee River at Kezar Falls to Class C. Further abatement measures are recommended at Conway, New Hampshire.

Implementation of the above measures will result in essentially complete abatement of major sources of pollution and raise the quality of the waters to recommended standards. Wastes from a number of smaller communities along the river are not considered to be too significant. The abatement of pollution from these smaller sources should receive attention following action at other waste sources, unless specific engineering studies indicate that the combination of the wastes from these towns and their respective industries is economical.

COSTS

Estimates of costs of recommended pollution abatement measures have been based on provisions for secondary treatment, including disinfection, of all waste discharges. The estimates shown in Table VII-2 and VII-3 were prepared by FWPCA utilizing costs obtained from consulting engineering and state classification reports, state agencies, and generalized treatment plant cost curves. These costs have been adjusted where necessary. These estimates serve only to indicate the order of magnitude of financial investment needed to abate pollution on the interstate streams of a basin and do not replace the more detailed estimates developed as a result of engineering studies for specific municipalities or industries. Pollution abatement facilities for sources discharging wastes to the interstate waters of the Saco River Basin will require a minimum expenditure of approximately $7,000,000.

Table VII-2

SACO RIVER BASIN

Saco River

Recommended Abatement Measures and Estimated Costs

Source[1]	Recommended Treatment	Estimated Cost[2]	Remarks
Conway, N. H. (M)	Secondary	$ 590,000*	*Represents total cost of sewerage treatment for entire community
Fryeburg, Me. Burnham & Morrill Cannery (I)	"	Undet.*	*Data not available
Bar Mills, Me. Rogers Fibre Co. (I)	"	Undet.*	*Data not available
Biddeford, Me. Pepperell Mfg. Co. (I)	"	800,000	
Saco, Me. (M)	"	1,700,000*	*Includes cost of transporting sewage from Bear Brook Primary Plant
Saco Tanning Corp. (I)	"	3,400,000	
Total (Table VII-2)		$6,490,000	

---

1. Parenthetical M and I following the listed waste source indicate municipal or industrial sources, respectively.

2. Estimated costs for municipal waste sources include costs for waste treatment facilities and interceptors, where required. Estimated costs for industrial waste sources include costs for waste treatment facilities only.

Table VII-3

SACO RIVER BASIN

Interstate Tributary
Ossipee River

Recommended Abatement Measures and Estimated Costs

Source[1]	Recommended Treatment	Estimated Cost[2]	Remarks
Kezar Falls, Maine Strafford Woolen Co. (1)	Secondary	$ 166,000	
Total (Table VII-3)		166,000	
Total (Table VII-2)		6,490,000	
TOTAL		$6,656,000	

---

1. Parenthetical I following the listed source indicates an industrial source.

2. Estimated cost for the industrial waste source includes cost for waste treatment facility only.

RECENT PROGRESS IN POLLUTION CONTROL

During 1955 and 1956, the water pollution control agencies in New Hampshire and Maine completed surveys for the classification of the Saco River. Classifications were proposed by the states and approved by the New England Interstate Water Pollution Control Commission and the New Hampshire Legislature. The Maine Legislature, however, did not accept the recommendations of the pollution control agency and assigned lower classifications to some sections of the river. Under the approved classification of the Saco River at the New Hampshire-Maine State line, the states are pledged to establish and maintain the waters in Class B condition.

To supplement Federal grants under Public Law 660 for the construction of sewage treatment facilities by municipalities, the New Hampshire and Maine Legislatures authorized state grants-in-aid of an additional 40 and 30 per cent, respectively. New Hampshire also has a law exempting from local taxation for twenty-five years a percentage of each facility built, constructed or placed in operation for water pollution control. Effective September 16, 1961, the Legislature of the State of Maine passed an Act exempting industrial disposal systems from property tax.

In August, 1961, the Town of Conway, New Hampshire applied for an advance of $1,000 from the Housing and Home Finance Agency to review and update their 1949 Preliminary Engineering Study. A study conducted by a consulting engineering firm in 1962 recommended the construction of collecting sewers, interceptors, two pumping stations, and a sewage stabilization pond to alleviate local nuisances in the town and satisfy the requirements of the New Hampshire Water Pollution Commission. The Commission awarded the project a priority certification in December 1963.

At Bar Mills, Maine, the Rogers Fibre Company is attempting, with State assistance, to significantly decrease its pollutional load on the Saco River by establishing in-plant changes in the form of recirculating process water. The State of Maine is also assisting the Burnham and Morrill Cannery to eliminate its polluting discharges.

In 1965, the City of Biddeford, Maine, completed construction of a secondary treatment plant at a cost of $1,560,000; this plant services approximately 15,000 of the City's 19,255 population.

In 1962, Saco completed construction of two small sewage treatment plants servicing a total of 1,200 persons. During 1963, Saco was offered federal funds to aid in the construction of interceptors and secondary treatment facilities but declined both APW and WPC offers. The Saco Tanning Corporation recently had engineering studies conducted to determine methods of abating its waste discharges. The studies recommended primary treatment with the use of chemicals to maintain a 50 per cent BOD removal at a cost of approximately $370,000.

BACKGROUND FOR RECOMMENDATIONS

Pertinent Basin Characteristics

The Saco River originates at the outlet of the Saco Lake in Crawford Notch in the White Mountains of east-central New Hampshire and flows in a general southeasterly direction for about 124 miles to the Maine Coast near Saco and Biddeford, Maine. The river crosses the New Hampshire-Maine State line at about river mile 83. The average yearly flow varies from 921 cfs at Conway, New Hampshire, to 2,690 cfs at Cornish, Maine.

The Saco's chief tributary, the Ossipee River, originates at the outlet of Ossipee Lake at Effingham Falls, New Hampshire, and flows in an easterly direction for approximately eighteen miles to the Saco River (river mile 42) at Cornish, Maine. The Ossipee's average yearly flow at Cornish is approximately 873 cfs. The larger communities in the basin are Conway, New Hampshire, and Biddeford and Saco, Maine.

Present Water Quality

The present quality of the waters of the Saco and Ossipee Rivers is shown in Figure VII-2, and the major waste contributors affecting this quality are shown in Tables VII-4 and VII-5. The quality as shown was determined after analyzing data from various sources including the Classification Reports of the Saco and Ossipee Rivers, prepared by the States of Maine and New Hampshire. Because of differences between the two state classification systems and for the sake of uniformity, an attempt has been made by the FWPCA to show the quality of the waters in relation to the New England Interstate Water Pollution Control Commission Standards of Water

Quality dated September 14, 1966. These standards of quality are shown in Appendix A.

The Saco River is relatively free from pollution between its headwaters and Conway, New Hampshire, the first major population center. At Conway, private sewers discharge untreated sewage to the river, causing a definite change in water quality. From Conway to Cornish, Maine, the stream is in a state of recovery. However, for approximately six weeks per year, a corn cannery at Fryeburg, Maine, discharges substantial amounts of wastes to the Saco River, causing periodic degradation for a short reach downstream.

Below Steep Falls, Maine, the bacterial loading begins to increase due to private sewer discharges at Steep Falls, Limington and West Buxton. At Bar Mills, wastes discharged from a fibre company reduce the dissolved oxygen level below 5 mg/l. From Bar Mills to the zone of tidal influence above Biddeford and Saco, the stream is again in a state of recovery. Untreated private, municipal and industrial wastes at Saco and wastes at Biddeford produce obnoxious sludge banks, heavy scums, sludge mats and high bacterial loadings from their entry points to the Atlantic Ocean.

The Ossipee River, from its headwaters to Kezar Falls, Maine, is free of major pollution. At Kezar Falls, wastes discharged by a woolen company and also by private individuals deplete the dissolved oxygen level below 5 mg/l. From Kezar Falls to the river's confluence with the Saco River, the Ossipee River is in a state of recovery.

In general, the stream conditions throughout most of the Saco River Basin are comparatively good and do not hamper intended uses. The main use of the rivers, particularly in the upper portions, is for recreational purposes Industrial development is limited at the present time.

Table VII-4

SACO RIVER BASIN

Saco River

Sources of Pollution

Source[1]	River Mile	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treatment	Waste Flow, Mgd.	Waste Load, P.E. of BOD
Conway, N. H. (M)	91	1,143	100	Municipal	None	Undet.	100
Fryeburg, Me.							
Burnham and Morrill Cannery (I) (operates six weeks per year)	82		30	Corn Canning	"	"	Undet.
Bar Mills, Me.							
Rogers Fibre Co. (I)	21		50	White Water	"	"	Undet.
Biddeford, Me. (M)	9	19,255	15,000	Municipal	Secondary	"	3,000
Pepperell Mfg. Co. (I)	9		1,500	Textile	None	"	10,000
Saco, Me. (M)	5	10,515	5,000	Municipal	None	"	4,500
Bear Brook Plant (M)	5		1,200	Municipal	Primary	0.3	700
Saco Tanning Corp. (I)	5		100	Leather and Tanning	None	Undet.	91,000

---

1. Parenthetical M and I following the listed waste source indicate municipal or industrial sources, respectively.

Table VII-5

SACO RIVER BASIN

Interstate Tributary
Ossipee River

Source of Pollution

Source[1]	River Mile	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treatment	Waste Flow, Mgd.	Waste Load, P.E. of BOD
Kezar Falls, Maine							
Strafford Woolen Co. (I)	44		150	Dye	None	Undet.	2,100

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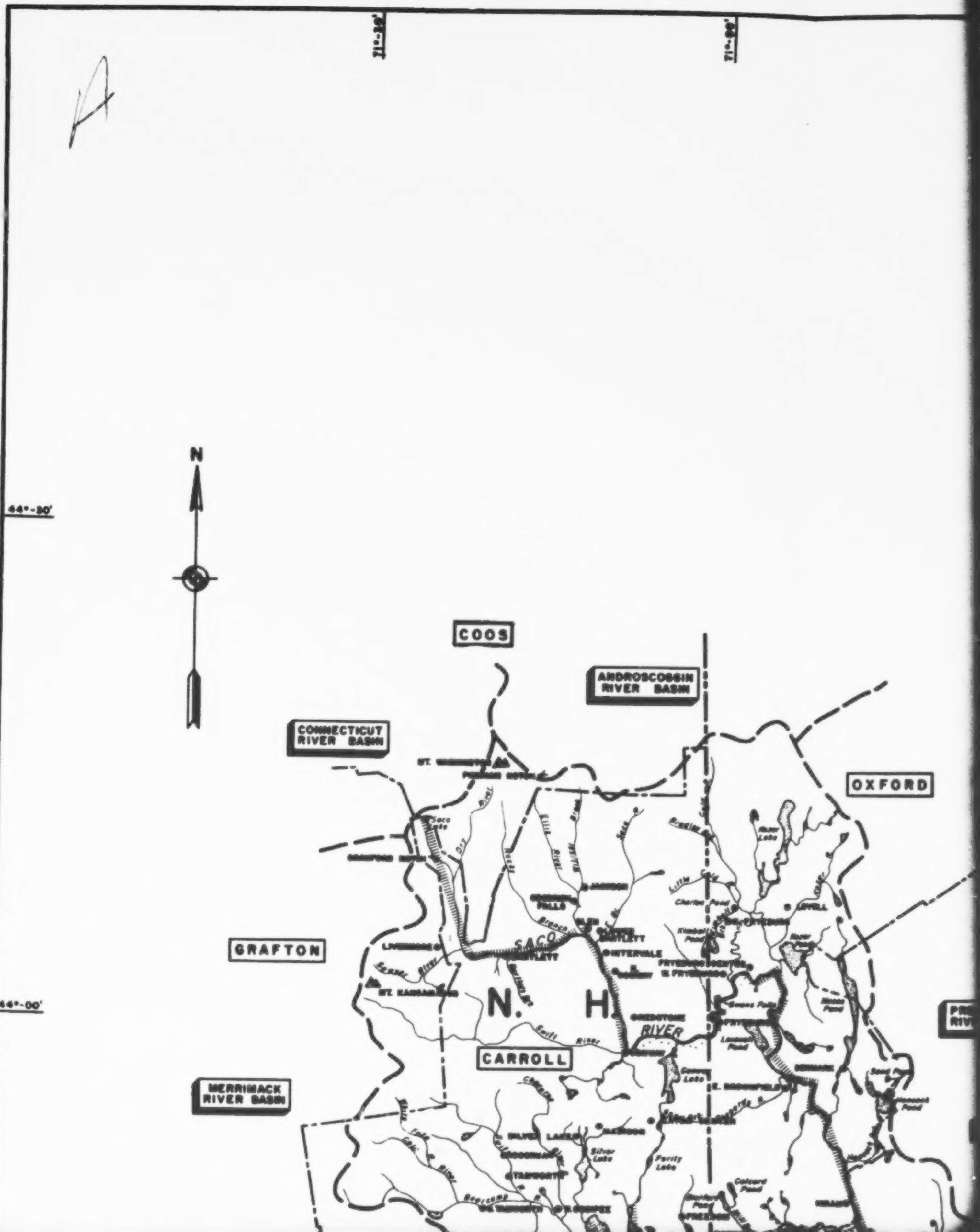
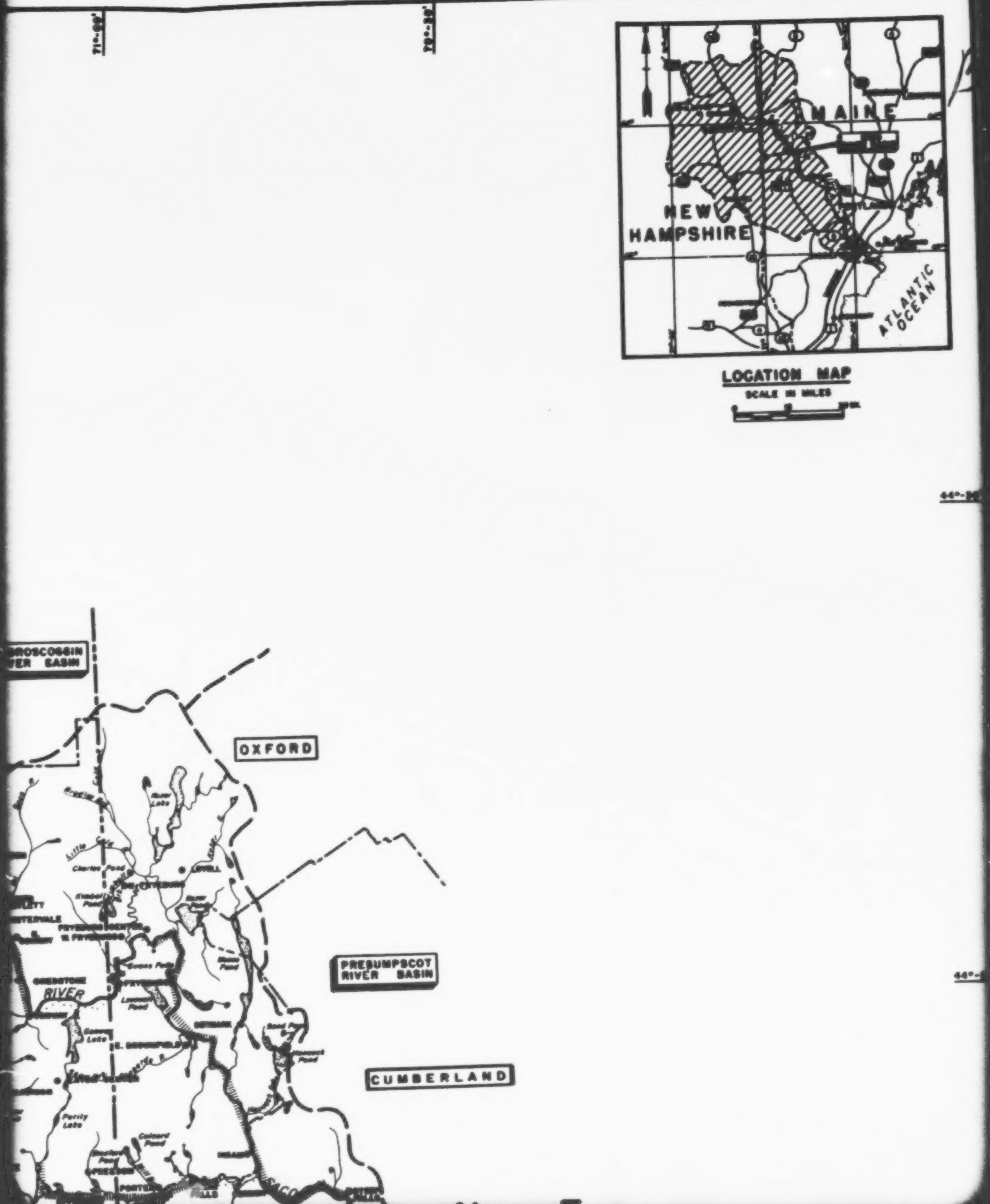
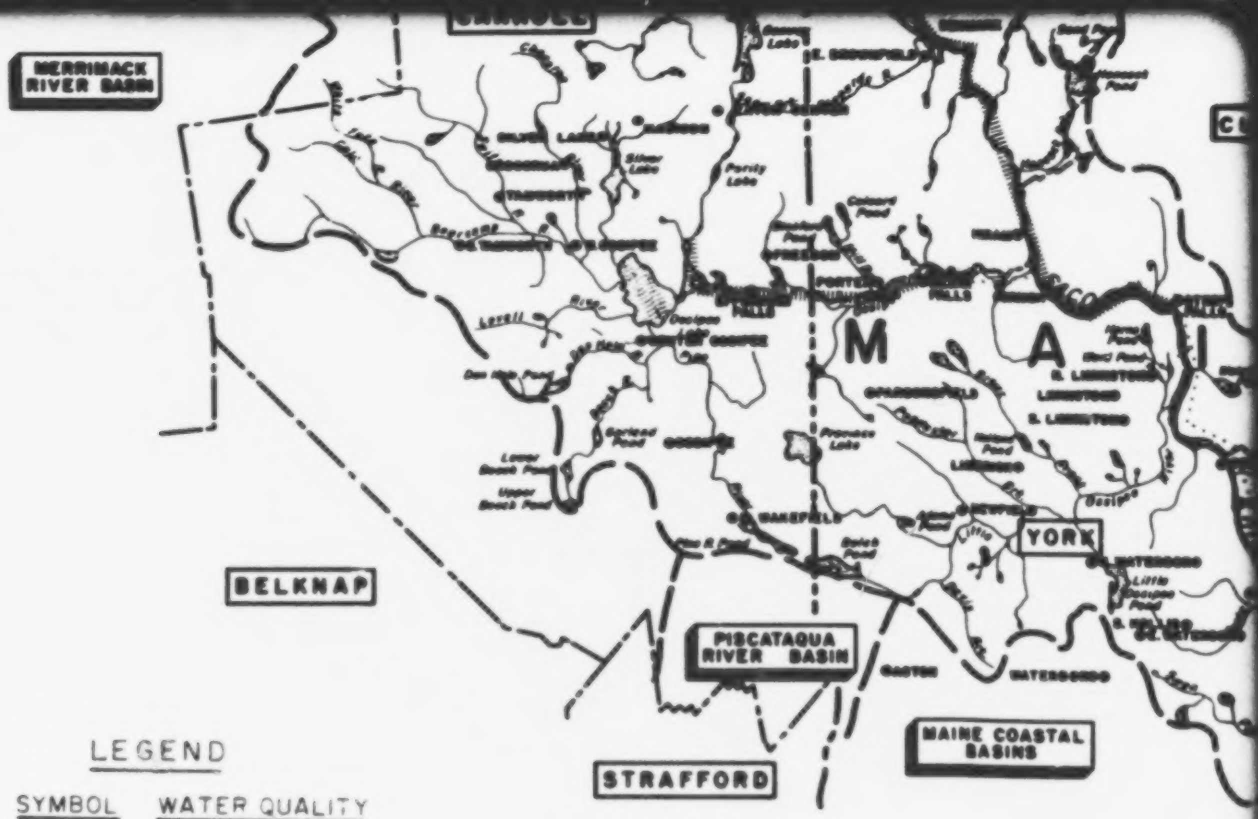
1. Parenthetical I following the listed waste source indicates an industrial source.

A


71°-30'
71°-00'
44°-30'
44°-00'
N
COOS
ANDROSCOGGIN RIVER BASIN
CONNECTICUT RIVER BASIN
MT. WASHINGTON
Saco Lake
Dry River
Rocky Branch
Ellis River
Wildcat Brook
Saco R.
Little Cold R.
Charles Pond
Kimball Pond
JACKSON
GLEN
INTERVALE
LOVELL
OXFORD
GRAFTON
LIVERMORE
MT. KANCAMAGUS
SACO
BARTLETT
W. FRYEBURG
N.
H.
RIVER
Swift River
CARROLL
Conway Lake
Lovewell Pond
E. BROWNFIELD
Moose Pond
Sand Pond
Hancock Pond
MERRIMACK RIVER BASIN
SILVER LAKE
Silver Lake
Purity Lake
Bearcamp R.
Colcord Pond


71°-00'
70°-30'
MAINE
NEW HAMPSHIRE
ATLANTIC OCEAN
LOCATION MAP
SCALE IN MILES
44°-30'
ROSCOGGIN
VER BASIN
OXFORD
Little Cold
Charles Pond
Kimball Pond
LOVELL
FRYEBURG CENTER
W. FRYEBURG
RIVER
Lovewell Pond
PRESUMPSCOT RIVER BASIN
E. BROWNFIELD
CUMBERLAND
Purity Lake
Colcord Pond
FREEDOM
PORTER
FALLS
SACO

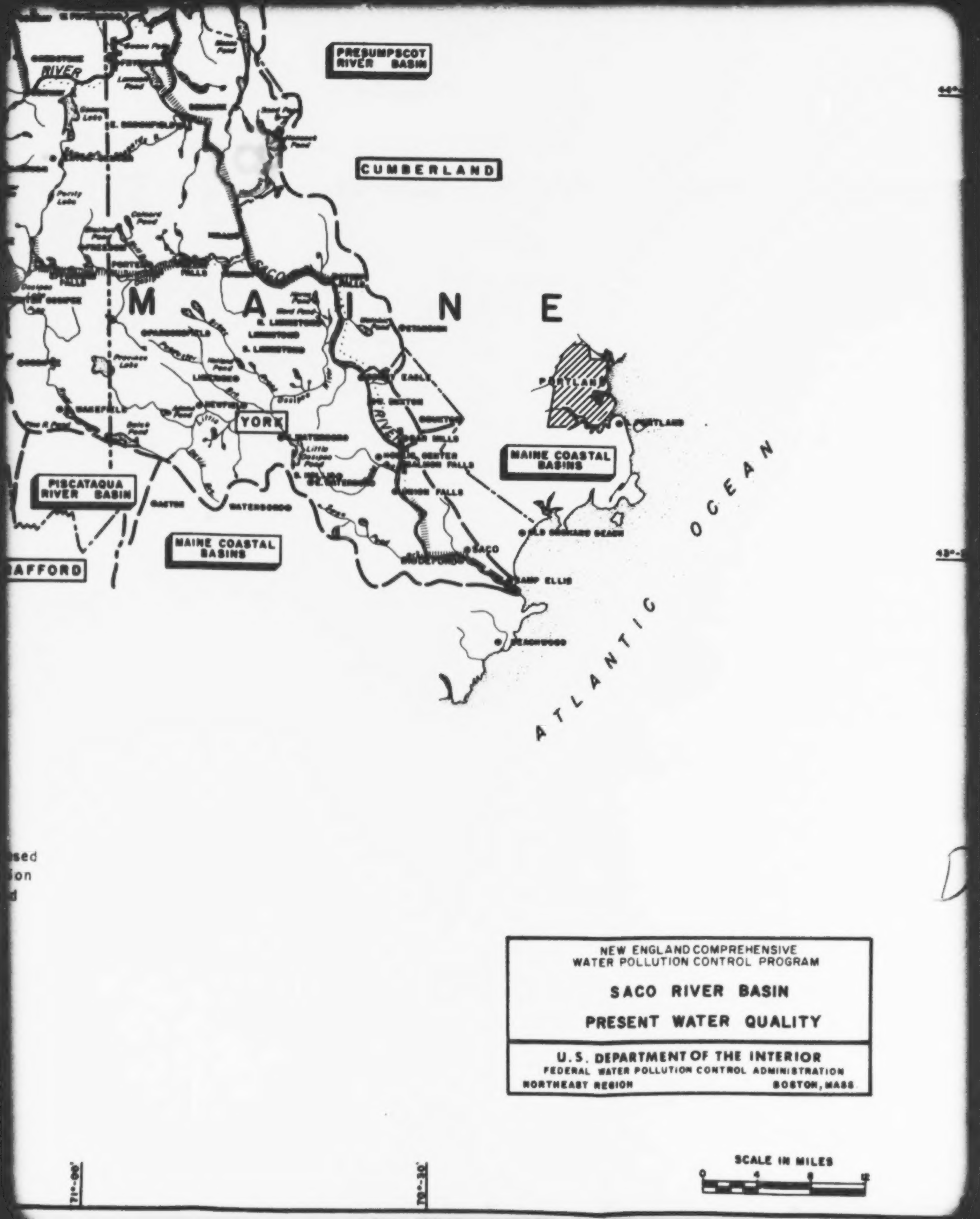

MERRIMACK RIVER BASIN
CARROLL
M
A
YORK
BELKNAP
PISCATAQUA RIVER BASIN
STRAFFORD
MAINE COASTAL BASINS
Lovell River
Ossipee Lake
Silver Lake
Province Lake
WAKEFIELD
NEWFIELD
LIMERICK
WATERBORO
73°-30'
71°-30'
71°-00'

LEGEND

SYMBOL	WATER QUALITY
┃┃┃┃┃┃┃┃	A
▤▤▤▤	B
	C
— — —	D
━━━━	Unsatisfactory

NOTES

1. Estimates of the present water quality are based upon the New England Interstate Water Pollution Control Commission Standards of Quality dated September 14, 1966
2. Conditions indicated are estimated to occur during periods of low stream flow



PRESUMPSCOT RIVER BASIN
CUMBERLAND
MAINE
SACO
RIVER
YORK
PORTLAND
MAINE COASTAL BASINS
PISCATAQUA RIVER BASIN
MAINE COASTAL BASINS
AFFORD
E. LIMINGTON
LIMINGTON
S. LIMINGTON
NEWFIELD
WAKEFIELD
WATERBORO
BONNY EAGLE
W. BUXTON
BUXTON
BAR MILLS
HOLLIS CENTER
SALMON FALLS
UNION FALLS
OLD ORCHARD BEACH
SACO
BIDDEFORD
CAMP ELLIS
ATLANTIC OCEAN
44°
43°-30'
71°-00'
70°-30'
sed
ion
d
SCALE IN MILES
0
4
8
12

NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM

SACO RIVER BASIN

PRESENT WATER QUALITY

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION BOSTON, MASS.

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2. New Hampshire Water Pollution Commission, Staff Report on Part of the Saco River Watershed, May 1952.

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4. U. S. Department of Health, Education, and Welfare, Summary Report on Quality of Interstate Waters, Saco River, New Hampshire-Maine, January 1965.

5. U. S. Department of the Interior, Federal Water Pollution Control Administration - Project Register, September 30, 1966.

6. Water Improvement Commission, Reclassification Report - Portions of Saco River, Tributaries, and Estuary, 1966.

7. Classification Report for Tidewaters of York County, 1957.

8. Water Improvement Commission, Revised Statutes of 1964, Title 38, Chapter 3 (As Amended), Maine, September 3, 1965.

CHAPTER VIII
SOUTH MAINE COASTAL BASIN

SUMMARY

The major water quality problems of the South Maine Coastal Basin occur in the vicinity of Portland and South Portland, Maine, since most of the domestic, municipal and industrial wastes generated by these communities are discharged to the Fore River, Back Cove and Portland Harbor areas. This results in severe water quality degradation and prolonged periods of nuisance conditions. Other water quality problems occur in many of the resort communities adjoining the coastal waters of this region. Large summer population increases in these towns and inadequate treatment facilities degrade the water quality of the towns' coastal waters. Immediate pollution abatement should, therefore, be directed toward the Portland-South Portland coastal waters and the most seriously polluted waters near resort communities. Pollution abatement will require a minimum expenditure of approximately $32,000,000. Immediate water pollution control needs are summarized in Table VIII-1 and pinpointed in Figure VIII-1. The priorities recommended were chosen on the basis of their relative importance in upgrading significant areas of the coast. These priorities, however, are not intended to prevent or delay the initiation or completion of independent pollution control programs by municipalities or industries.

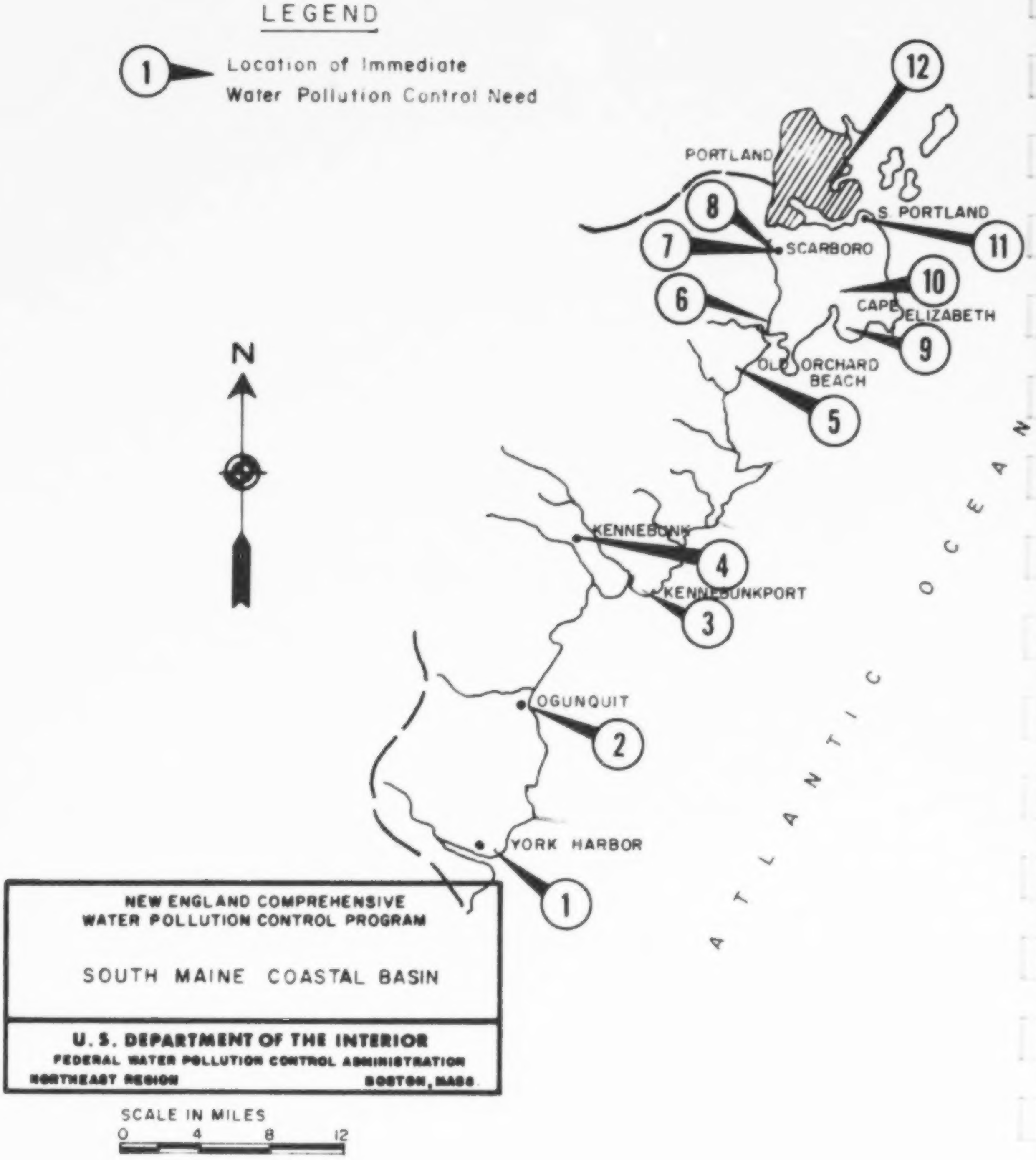
LEGEND
1 Location of Immediate Water Pollution Control Need
N
PORTLAND
S. PORTLAND
SCARBORO
CAPE ELIZABETH
OLD ORCHARD BEACH
KENNEBUNK
KENNEBUNKPORT
OGUNQUIT
YORK HARBOR
ATLANTIC OCEAN
1
2
3
4
5
6
7
8
9
10
11
12
NEW ENGLAND COMPREHENSIVE WATER POLLUTION CONTROL PROGRAM
SOUTH MAINE COASTAL BASIN
U. S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION
BOSTON, MASS.
SCALE IN MILES
0
4
8
12

FIGURE VIII-

Table VIII-1

SOUTH MAINE COASTAL BASIN

Coastal Waters

Summary of Immediate Water Pollutional Control Needs

Location Map Key No.	Responsibility	Need	Priority[1]
12	Portland, Me.	Secondary Waste Treatment	A
11	S. Portland, Me.	"	A
5	Old Orchard Beach, Me.	"	B
7	Scarboro, Me.	"	B
8	Canning Plant, Scarboro, Me.	"	B
8	Humpty Dumpty Potato Chip Co. Scarboro, Me.	"	B
1	York, Me.	"	C
3	Kennebunkport, Me.	"	C
4	Kennebunk, Me.	"	C
6	Higgins Beach, Scarboro, Me.	"	C
10,9	Cape Elizabeth, Me. Crescent Beach	" "	C C
1,2,3,4, 5,6,9,11	State of Maine and affected communities	Proceed to undertake planning programs for abatement of pollution from individual outlets	A

---

1. Priorities of actions are divided into three categories based on their impact on water quality improvements.

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IMMEDIATE POLLUTION CONTROL NEEDS

The present nuisance conditions existing in the Fore River, Back Cove and Portland Harbor indicate that an immediate pollution control need exists for the abatement of contributing sources. Therefore, in view of the magnitude of the pollutional loads, immediate pollution abatement measures in the form of secondary treatment or its equivalent should be directed to the Portland-South Portland area.

Implementation of these measures in the Portland-South Portland area will result in abatement of the major pollution sources and the upgrading and cessation of nuisance conditions.

Along the remainder of the South Maine coast, large transient populations coupled with resident populations and industries contribute to the degradation to Class C[1] at many locations. The abatement of pollution sources causing this degradation is recommended; however, abatement of these sources should receive attention subsequent to abatement of pollution from the Portland-South Portland area.

Although the degree of degradation at these locations along the remainder of the Maine Coast is generally uniform, a somewhat more extensive area occurs near Scarboro and Old Orchard Beach. The length of the affected shoreline suggests that this area should receive attention prior to the more isolated instances of degradation.

Implementation of these recommendations will result in significant improvement of the waters affected and will materially aid in permitting higher uses.

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[1] Based upon New England Interstate Water Pollution Control Commission Water Quality Standards shown in Appendix A.

COSTS

Estimates of costs for recommended pollution abatement measures have been based on provisions for secondary treatment, including disinfection, of all waste discharges. The estimates shown in Table VIII-2 were prepared by FWPCA utilizing costs obtained from consulting engineering and state classification reports, state agencies, and generalized treatment plant cost curves. These costs have been adjusted where necessary. These estimates serve only to indicate the order of magnitude of financial investment needed to abate pollution on the interstate streams of a basin and do not replace the more detailed estimates developed as a result of engineering studies for specific municipalities or industries. Pollution abatement facilities for sources discharging wastes to the interstate waters of the Saco River Basin will require a minimum expenditure of approximately $7,000,000.

Table VIII-2

SOUTH MAINE COASTAL BASIN

Coastal Waters

Recommended Abatement Measures and Estimated Costs

Source[1]	Recommended Treatment	Estimated Cost[2]	Remarks
York, Me. (M)	Secondary	$ 827,000	
Kennebunk, Me. (M)	"	258,000	
Kennebunkport, Me. (M)	"	640,000	
Old Orchard Beach, Me. (M)	"	220,000	
Scarboro, Me. (M)	"	63,000	
Higgins Beach (M)	"	528,000	
Humpty Dumpty Potato Chip Co. (I)	"	85,000	
Cape Elizabeth, Me. (M)	"	268,000	
Crescent Beach (M)	"	38,000	
South Portland, Me. (M)	"	2,890,000	
Portland, Me. (M)	"	25,800,000	
Total		$31,617,000	

1. Parenthetical M and I following the listed waste source indicate municipal or industrial sources, respectively.
2. Estimated costs for municipal waste sources include costs for waste treatment facilities and interceptors, where required. Estimated costs for industrial waste sources include costs for waste treatment facilities only.

RECENT PROGRESS IN POLLUTION CONTROL

The State of Maine has provided for the Water Improvement Commission to make recommendations to the Legislature with respect to the classification of the waters, based on standards of quality and use. In 1965, following recommendations from this Commission, the Maine Legislature adopted classification standards which include the South Maine coastal waters.

The State of Maine provides funds for a grant-in-aid program amounting to 30 per cent of the project's cost. Within the last five years, the FWPCA has authorized grants-in-aid for the construction of interceptors and primary or secondary treatment plants with a combined construction cost of $1,557,000. These facilities have been built or are under construction at Ogunquit, Old Orchard Beach, Scarboro and Cape Elizabeth, Maine.

In 1962, the City of Portland began a program of interceptor sewer construction. An interceptor sewer and pumping station constructed along the south side of Back Cove presently discharges wastes near the cove's confluence with the ocean, thus eliminating significant amounts of pollution to Back Cove

The City of Portland also has had detailed engineering studies of the existing sewerage system completed and has been furnished recommendations for future pollution abatement.

BACKGROUND FOR RECOMMENDATIONS

Pertinent Basin Characteristics

The coastal waters of the South Maine Coastal Basin cover the Maine coast and tidal streams from York Harbor to Portland, Maine, a distance of approximately fifty-five miles.

The Portland-South Portland area, with a combined population of over 95,000, is the largest urban area in Maine as well as a major industrial center and seaport. Many of the other coastal communities in the region, such as Ogunquit and Old Orchard Beach, are popular tourist and recreation centers and support significant population increases during the summer months. The coastal streams at Scarboro contain highly productive clam flats.

Present Water Quality

The present quality of the coastal waters of the South Maine Coastal Basin is shown in Figure VIII-2, and the major waste contributors are shown in Table VIII-3. The quality as shown was determined after analyses of data from various sources including the Classification Reports of the tidewaters of York and Cumberland counties prepared by the State of Maine. The quality of coastal waters are based on the New England Interstate Water Pollution Control Commission Standards of Water Quality, dated September 14, 1966, and shown in Appendix A.

Essentially, all municipal and industrial wastes discharged by the cities and industries of Portland and South Portland are untreated. As a result of these discharges, there are nuisance conditions on Fore River, Back Cove and Portland Harbor caused by odors, floating solids, and bacterial pollution. In addition to the above sources of pollution, the many ships along the waterfront contribute to the pollution of Portland Harbor.

Large population increases during the summer months at the many recreation areas along the coast coupled with the lack of sufficient waste treatment facilities substantially increase the pollutional load on coastal streams and degrade to Class C the quality of the waters at beaches of the resort communities of Ogunquit, Old Orchard Beach and Scarboro and at other locations along the coast. Industrial wastes from a potato chip company and a seafood cannery at Scarboro also contribute to the pollutional load. In addition to hampering recreational uses, the existing pollution conditions have caused the closing of some productive clam flats at Scarboro.

Approximately ten federal installations in the coastal basin discharge untreated wastes to the Atlantic Ocean. These include light house stations, Naval and Coast Guard bases, and a fuel supply depot. None of these installations, however, are major sources of pollution.

Table VIII-3

SOUTH MAINE COASTAL BASIN

Coastal Waters

Sources of Pollution

Source[1]	Coastal Waters	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treatment	Waste Flow, Mgd.	Waste Load, P.E. of BOD	Remarks
York								
York Harbor (M)*	Atlantic O.	4,663	2,100	Municipal	None	Undet.	2,100	*Many private outlets serving approx. 5,000 people in summer.
Wells								
Ogunquit (M)*	Atlantic O.	3,528	600	"	Secondary	Undet.	Undet.	*Private outlets serve over 5,000.
Kennebunk (M)*	Mousam R.	4,551	4,500	"	Primary	.5	"	*Many private outlets.
Kennebunk Bch. (M)	Atlantic O.		1,400*	"	Primary	.2	"	*Summer population only.
Kennebunkport (M)	Atlantic O.	1,851	No municipal system*					*Private outlets serve over 5,000 people during summer.

Table VIII-3 (Continued)

Source[1]	Coastal Waters	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treatment	Waste Flow, Mgd.	Waste Load, P.E. of BOD	Remarks
Old Orchard								
Old Orchard Bch. (M)*	Atlantic O.	4,580	2,300**	Municipal	Primary	Undet.	Undet.	*Many private outlets. **Summer population.
Scarboro (M)*	Spurwink R.	6,418	500	Municipal	Primary	Undet.	Undet.	*Many private outlets.
Canning Plant					None	"	"	
Humpty Dumpty Pot. Chip Co. (I)	Spurwink R.		65	Pot. Chip	None	.03	1,750	
Cape Elizabeth (M)*	Atlantic O.	5,505	2,500	Municipal	None	Undet.	2,500	*Many private outlets.
Cape Elizabeth (M)	Spurwink R.		600	"	Secondary	"	Undet.	
Crescent Beach (M)	Atlantic O.			"	Primary*	"	"	*Plant serves public beach.
S. Portland (M&I)*	Fore R.	22,788	17,000	"	None	"	"	*Many private outlets. Industrial wastes from a cannery & crabmeat proc. plant.
Portland (M&I)*	Atlantic O.	72,566	65,000	"	None	"	"	*Approx. 200 separate outlets discharging to Fore R., Back Cove & Portland Harbor. Outlets include great amount of industrial wastes.

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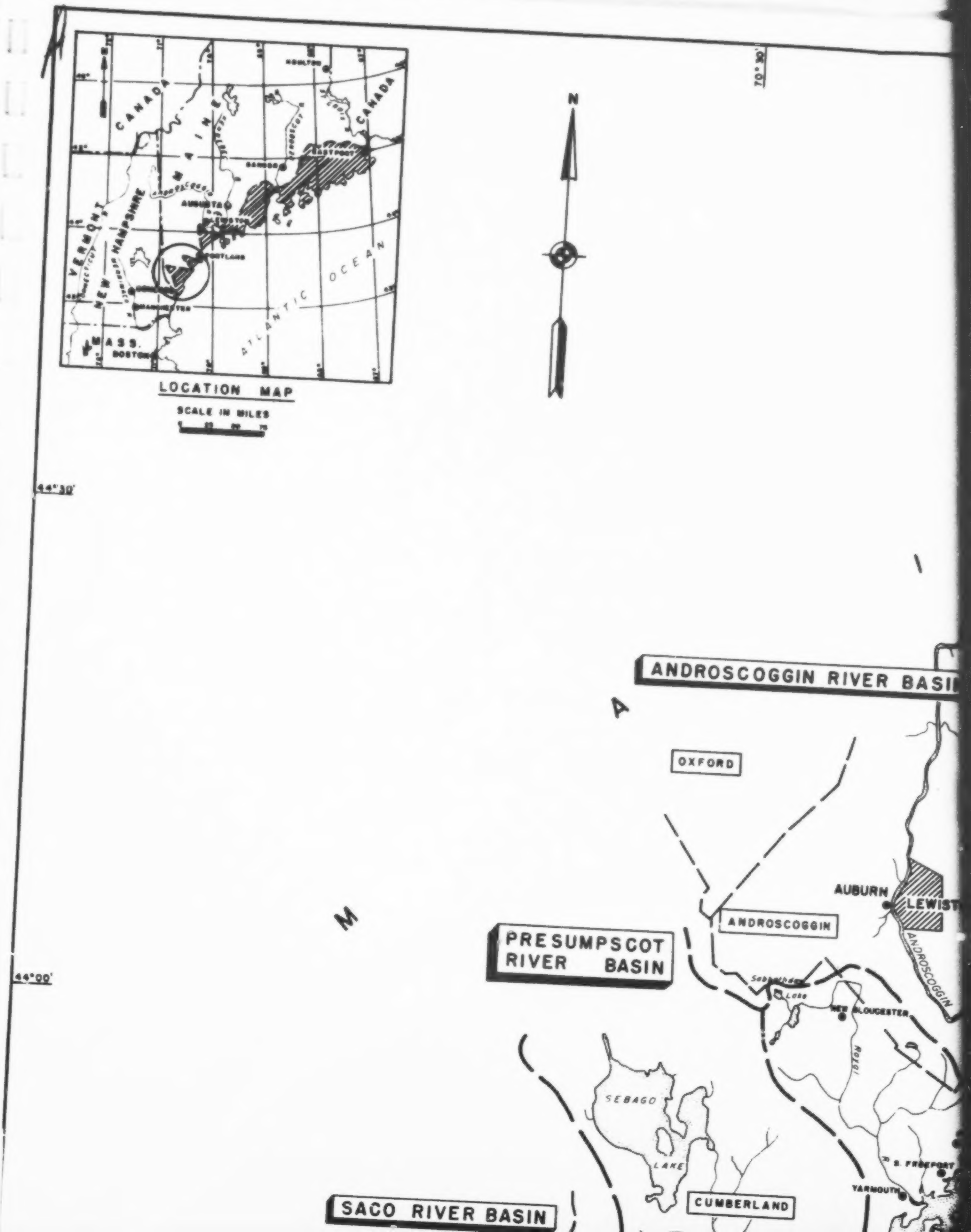
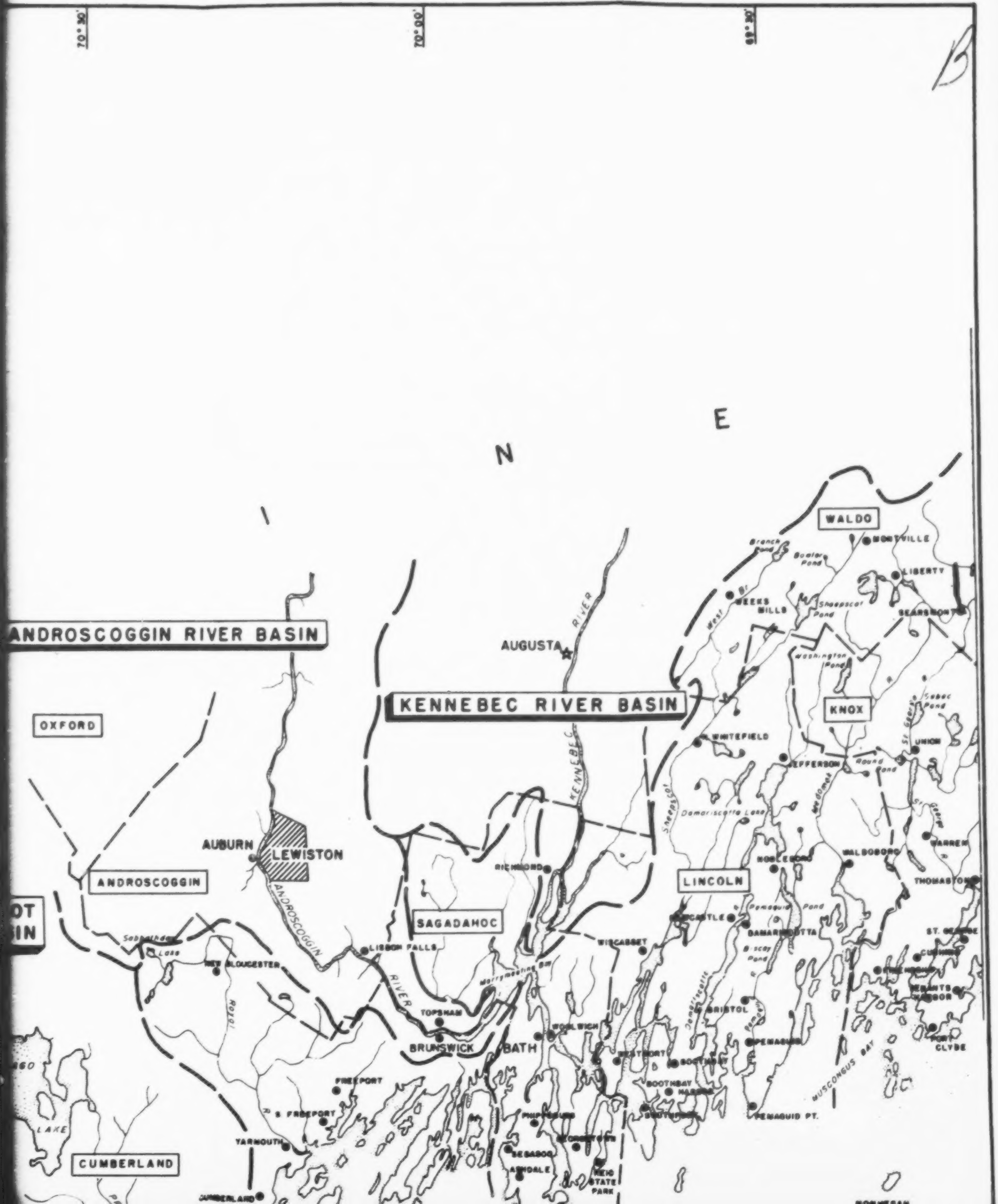
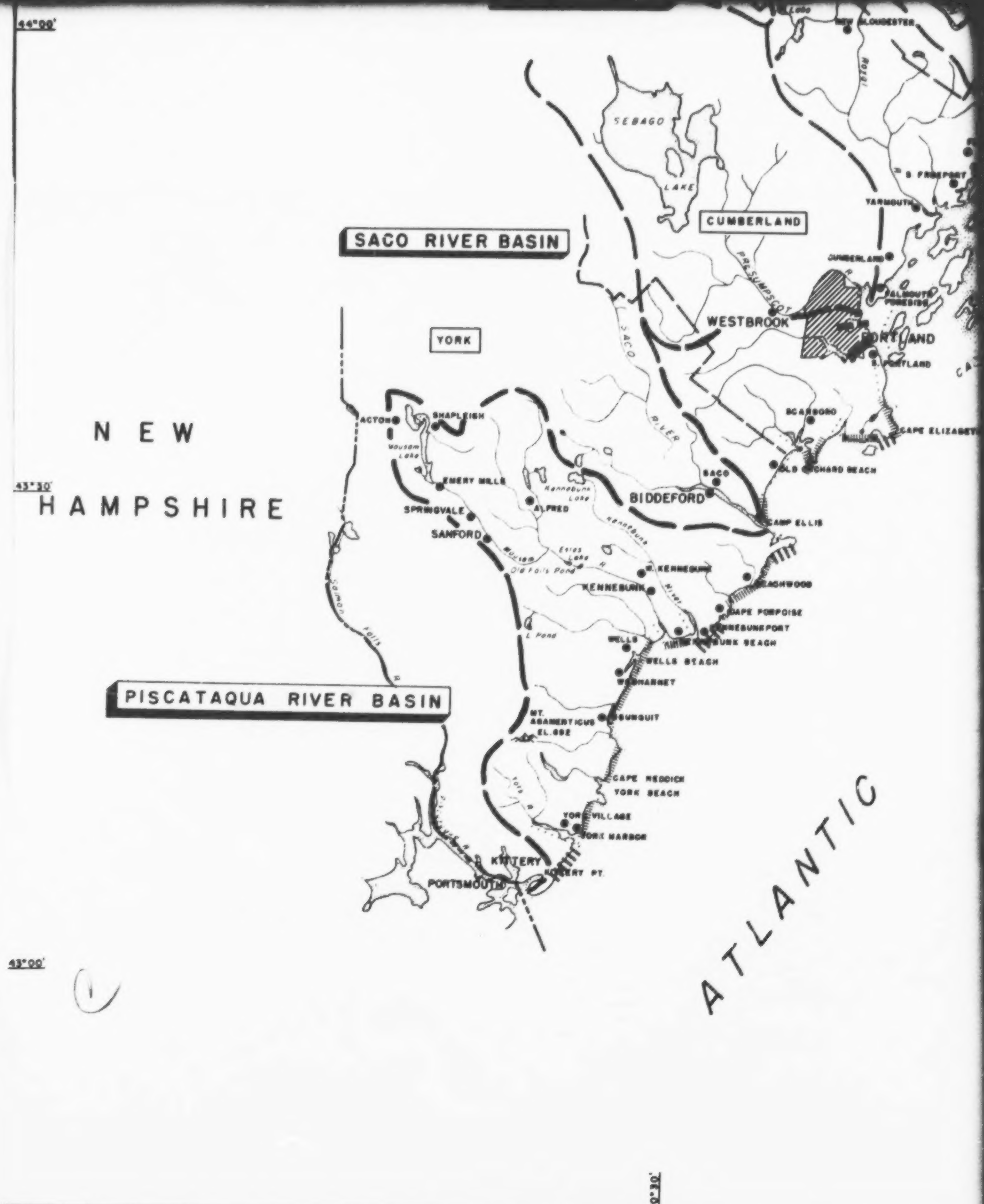
1. Parenthetical M and I following listed waste source indicate municipal or industrial sources, respectively.

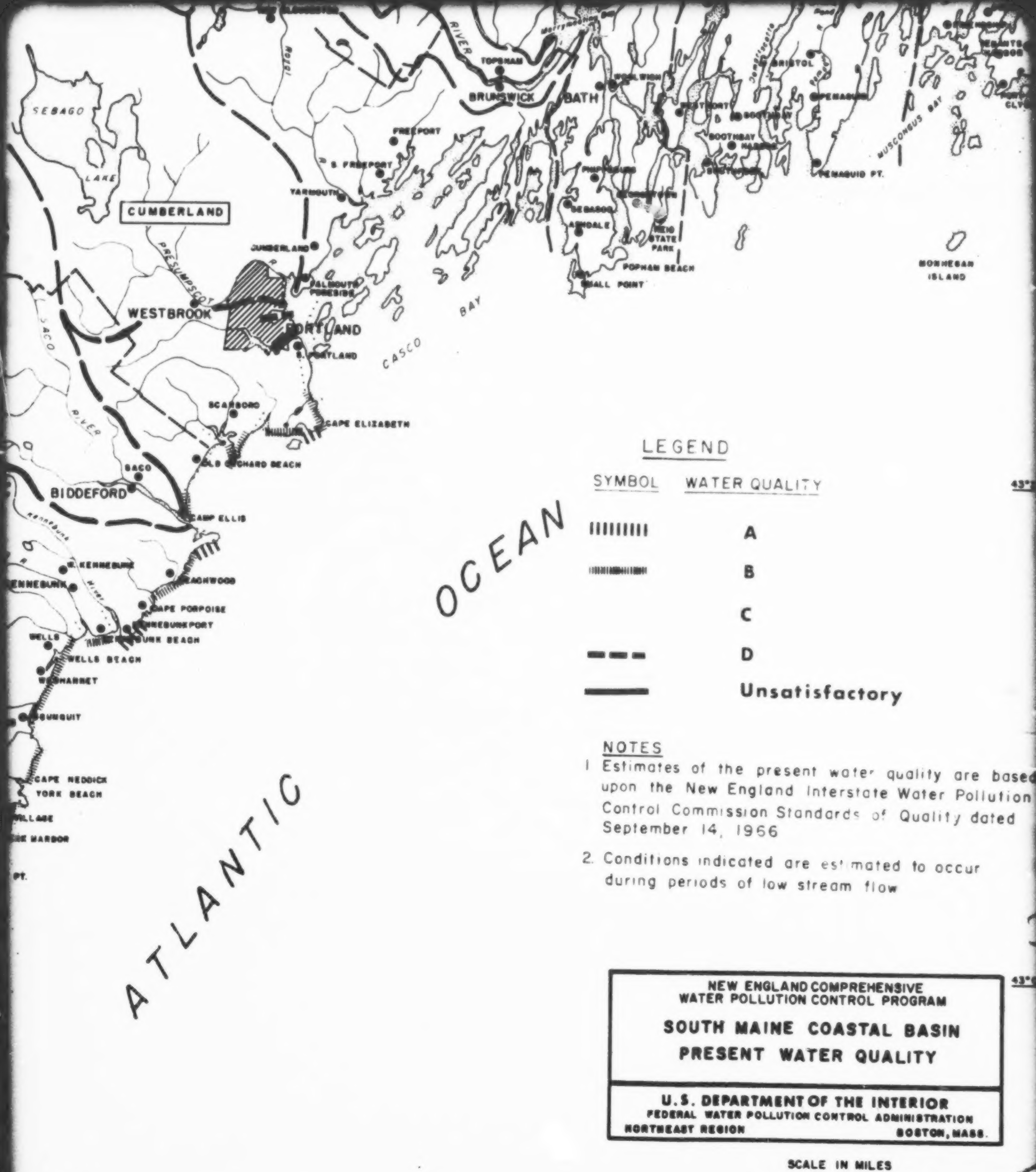

LOCATION MAP
SCALE IN MILES
CANADA
MAINE
VERMONT
NEW HAMPSHIRE
MASS.
BOSTON
MANCHESTER
PORTLAND
AUGUSTA
LEWISTON
BANGOR
EASTPORT
HOULTON
ATLANTIC OCEAN
N
70°30'
44°30'
44°00'
A
M
ANDROSCOGGIN RIVER BASI
OXFORD
ANDROSCOGGIN
AUBURN
LEWIST
ANDROSCOGGIN
PRESUMPSCOT RIVER BASIN
Sabbathday Lake
NEW GLOUCESTER
Royal
SEBAGO LAKE
S. FREEPORT
YARMOUTH
CUMBERLAND
SACO RIVER BASIN

B


70° 30'
70° 00'
69° 30'
I
N
E
ANDROSCOGGIN RIVER BASIN
KENNEBEC RIVER BASIN
OT
IN
OXFORD
ANDROSCOGGIN
SAGADAHOC
LINCOLN
WALDO
KNOX
CUMBERLAND
AUGUSTA
RIVER
KENNEBEC
AUBURN
LEWISTON
ANDROSCOGGIN
RIVER
Sabbathday
Lake
NEW GLOUCESTER
Royal
LISBON FALLS
RICHMOND
Merrymeeting Bay
TOPSHAM
BRUNSWICK
BATH
WOOLWICH
WISCASSET
FREEPORT
S. FREEPORT
YARMOUTH
CUMBERLAND
LAKE
PHIPPSBURG
SEBASCO
ARNDALE
GEORGETOWN
REID STATE PARK
WESTPORT
BOOTHBAY
BOOTHBAY HARBOR
SOUTHPORT
Sheepscot
Damariscotta Lake
NEWCASTLE
DAMARISCOTTA
Pemaquid Pond
Biscay Pond
Damariscotta
BRISTOL
Pemaquid
PEMAQUID
PEMAQUID PT.
MUSCONGUS BAY
NOBLEBORO
WALDOBORO
WHITEFIELD
JEFFERSON
Medomak
Round Pond
Washington Pond
Branch Pond
Bowler Pond
West Br.
WEEKS MILLS
Sheepscot Pond
MONTVILLE
LIBERTY
SEARSMONT
Sebec Pond
St. George
UNION
St. George
WARREN
THOMASTON
ST. GEORGE
CUSHING
FRIENDSHIP
TENANTS HARBOR
PORT CLYDE


44°00'
43°30'
43°00'
70°30'
NEW
HAMPSHIRE
SACO RIVER BASIN
PISCATAQUA RIVER BASIN
CUMBERLAND
YORK
ATLANTIC
SEBAGO
LAKE
Royal
NEW GLOUCESTER
S. FREEPORT
YARMOUTH
CUMBERLAND
FALMOUTH FORESIDE
PRESUMPSCOT R.
WESTBROOK
PORTLAND
S. PORTLAND
SACO RIVER
SCARBORO
CAPE ELIZABETH
OLD ORCHARD BEACH
SACO
BIDDEFORD
CAMP ELLIS
ACTON
SHAPLEIGH
Mousam Lake
EMERY MILLS
ALFRED
Kennebunk Lake
SPRINGVALE
SANFORD
Mousam
Estes Lake
R.
Old Falls Pond
Kennebunk River
W. KENNEBUNK
KENNEBUNK
BEACHWOOD
CAPE PORPOISE
KENNEBUNKPORT
KENNEBUNK BEACH
WELLS
WELLS BEACH
WEBHANNET
L. Pond
Salmon Falls R.
MT. AGAMENTICUS EL. 692
OGUNQUIT
CAPE NEDDICK
YORK BEACH
York R.
YORK VILLAGE
YORK HARBOR
KITTERY
KITTERY PT.
PORTSMOUTH
Piscataqua R.

1


SEBAGO
LAKE
CUMBERLAND
TOPSHAM
RIVER
BRUNSWICK
BATH
WOOLWICH
BRISTOL
BOOTHBAY
BOOTHBAY HARBOR
PEMAQUID
PEMAQUID PT.
MUSCONGUS BAY
FREEPORT
S. FREEPORT
YARMOUTH
CUMBERLAND
FALMOUTH FORESIDE
PRESUMPSCOT
WESTBROOK
PORTLAND
S. PORTLAND
CASCO BAY
SEBASCO
ARNDALE
REID STATE PARK
POPHAM BEACH
SMALL POINT
MONHEGAN ISLAND
SACO RIVER
SCARBORO
CAPE ELIZABETH
OLD ORCHARD BEACH
SACO
BIDDEFORD
CAMP ELLIS
KENNEBUNK
W. KENNEBUNK
BEACHWOOD
CAPE PORPOISE
KENNEBUNKPORT
KENNEBUNK BEACH
WELLS
WELLS BEACH
OGUNQUIT
CAPE NEDDICK
YORK BEACH
ATLANTIC OCEAN
70°30'
70°00'
SCALE IN MILES
0
4
8
12

LEGEND

SYMBOL	WATER QUALITY
┃┃┃┃┃┃┃┃	A
┿┿┿┿┿┿	B
	C
━ ━ ━	D
━━━━	Unsatisfactory

NOTES

1. Estimates of the present water quality are based upon the New England Interstate Water Pollution Control Commission Standards of Quality dated September 14, 1966
2. Conditions indicated are estimated to occur during periods of low stream flow

NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM

SOUTH MAINE COASTAL BASIN
PRESENT WATER QUALITY

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION BOSTON, MASS.

FIGURE VIII - 2

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2. U. S. Department of the Interior, Federal Water Pollution Control Administration-Project Register, September 30, 1966.

3. Maine Water Improvement Commission, Classification Report for Tidewaters of York County, 1957.

4. Maine Water Improvement Commission, Revised Statutes of 1964, Title 38, Chapter 3 (as amended), Maine, September 3, 1965.

5. U. S. Department of Health, Education, and Welfare, Waste Water Disposal Practices at Federal Installations, Maine, Volume 20, Washington, D. C., December 31, 1960.

CHAPTER IX
PISCATAQUA RIVER BASIN

SUMMARY

Major water quality problems of the interstate waters of the Piscataqua River Basin exist. Untreated or inadequately treated wastes discharged from industries and many relatively small towns degrade the Salmon Falls River in intermittent reaches. The lower reach of this river is degraded to a nuisance condition. The total determined BOD discharged to the river is about 48,000 P.E.

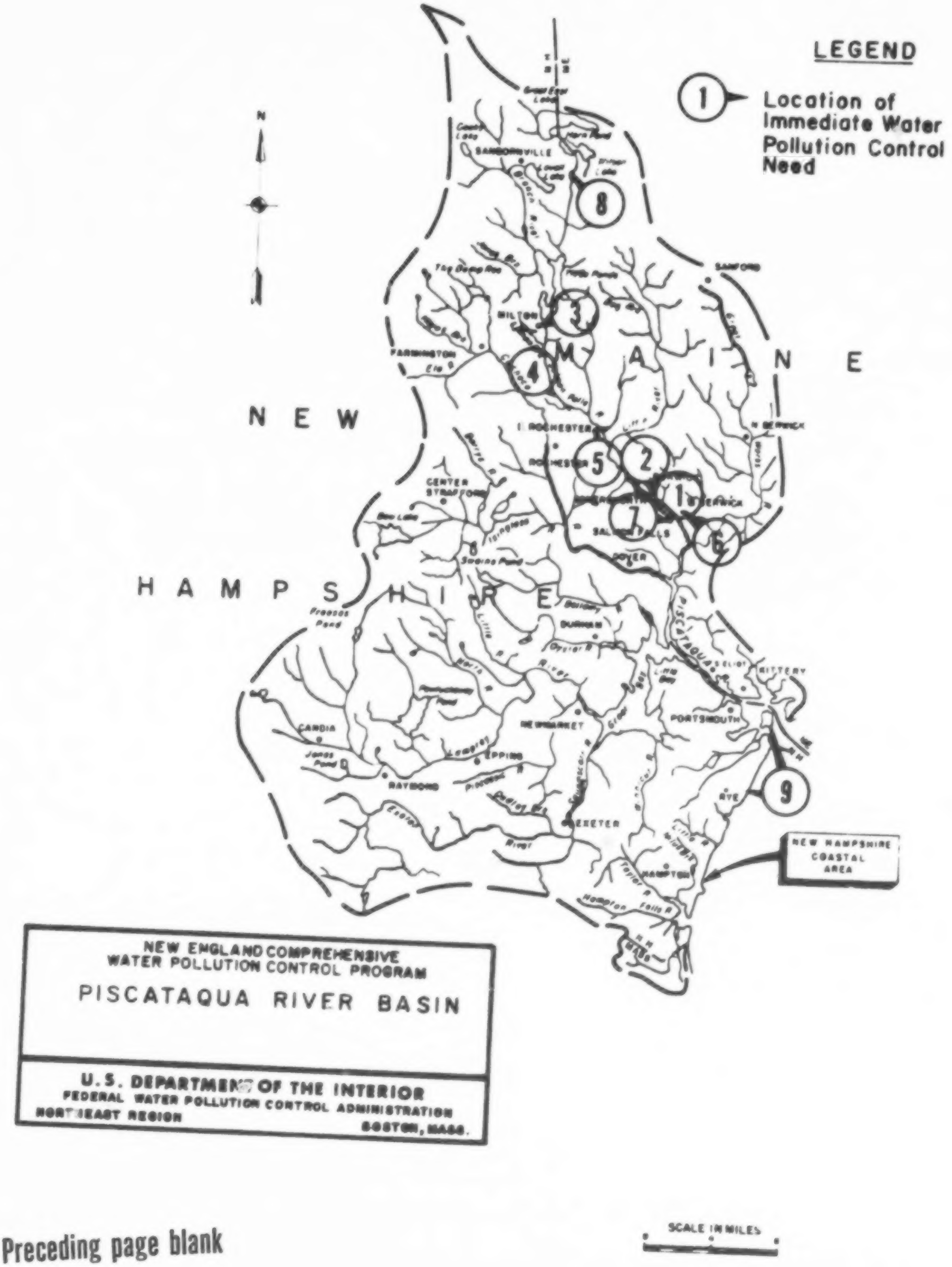
Industrial operations along this interstate stream consist of textile and leather-oriented industries. Two sources of industrial pollution which affect the quality in the lower reach are the Prime Tanning Company of Berwick, Maine, and Great Falls Bleach and Dye Works of Somersworth, New Hampshire. These two sources account for about 80 per cent of the known BOD contributed directly to the river.

Pollution control at these two sources and at municipal and other industrial sources is necessary to achieve adequate water quality levels. Pollution abatement will require an estimated minimum expenditure of $5,500,000 by the cities, towns and industries discharging wastes directly to the Salmon Falls River.

In the Piscataqua River and Bay area, the water quality is degraded by moderately sized municipalities, industries and possibly other unknown sources. The present Class D quality is caused primarily by floating solids, scum, oil and grease. Although pollution must be abated from all known sources, priorities of optimum timing to gain the greatest benefit cannot be established at this time. Pollution abatement at known sources will require a minimum expenditure of approximately $16,000,000 by the cities, towns and industries discharging directly to these waters.

The present quality of the direct Atlantic coastal waters is unknown. With the exception of the waste discharge from the treatment plant at Hampton, New Hampshire, which degrades a small bay, there are no major sources of pollution on the coast proper. The possibility does exist, however, that the quality of these coastal waters is affected by the polluted discharges of the Piscataqua and Merrimack Rivers. An immediate need, therefore, exists to determine the quality of the water along the coast and also to determine the effect of the Piscataqua and Merrimack Rivers' discharges.

Immediate water pollution needs are summarized in Table IX-1 and shown on the accompanying map, Figure IX-1.


LEGEND
① Location of Immediate Water Pollution Control Need
N
MAINE
NEW HAMPSHIRE
SANBORNVILLE
MILTON
FARMINGTON
SANFORD
E. ROCHESTER
ROCHESTER
N. BERWICK
CENTER STRAFFORD
SALMON FALLS
DOVER
BERWICK
DURHAM
PISCATAQUA R.
ELIOT
KITTERY
PORTSMOUTH
NEWMARKET
CANDIA
EPPING
RAYMOND
EXETER
RYE
HAMPTON
Exeter River
Lamprey R.
Little R.
Oyster R.
Great Bay
Little Bay
Hampton Falls R.
NEW HAMPSHIRE COASTAL AREA
N.H. MASS.
1
2
3
4
5
6
7
8
9
SCALE IN MILES

NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM

PISCATAQUA RIVER BASIN

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION BOSTON, MASS.

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FIGURE

Table IX-1

PISCATAQUA RIVER BASIN

Piscataqua and Salmon Falls Rivers and Coastal Waters

Summary of Immediate Water Pollution Control Needs

Location Map Key No.	Responsibility	Need	Priority[1]
1	Town of Berwick, Me. Prime Tanning Co.	Secondary Waste Treatment	A
2	Great Falls Bleach & Dye Wks., Somersworth, N. H.	"	A
3	Town of Milton, N. H.	"	B
3	Milton Leather Co., Green Tannery Co. and Spaulding Fibre Co., Milton, N. H.	"	B
4	Spaulding Fibre Co., N. Rochester, N. H.	"	B
5	Town of E. Rochester, N. H. Baxter Woolen Co.	"	B
2	Town of Somersworth, N. H.	"	B
2	General Electric, Somersworth, N. H.	"	B
6	Town of South Berwick, Me.	"	B
7	Town of Rollinsford, N. H. American Twine Co. Shoe Factory	"	B
8	Town of Wakefield, N. H.	"	B
9	Responsible Agencies	Evaluation of ocean water quality, currents & effects of sources of pollution on quality of water in Bay Area & Coastal Waters. Evaluation of pollution from intrastate tributaries.	A

---

1. Priorities of actions are divided into two categories based on their impact on water quality improvements.

IMMEDIATE POLLUTION CONTROL NEEDS

The pollution problems along the Salmon Falls River are caused by many relatively small municipalities and a few moderately sized industries. Although the water quality of the Salmon Falls River is degraded below each source of pollution, there are signs of recovery a little downstream. A map showing the estimated present water quality conditions is shown in Figure IX-2. In the reach of the Salmon Falls River from Berwick to tidehead, a short way below South Berwick, Maine, the entrance of industrial wastes from the Prime Tanning Company, Great Falls Bleach and Dye Works and other industries combine with the municipal wastes of Berwick, Maine, and Somersworth and Rollinsford (Salmon Falls), New Hampshire, to degrade the stream to nuisance conditions. Immediate abatement of wastes of the Prime Tanning Company and the Great Falls Bleach and Dye Works is recommended as soon as possible. The implementation of a program at these two sources will have a significant effect on the nuisance conditions in this reach and will help to ameliorate the Piscataqua and Bay area problems. Following implementation of programs at these two sources, immediate measures should be directed toward the remaining municipal and industrial sources along the Salmon Falls River.

The water quality of the Piscataqua River and Bay area is affected by the many municipalities and industries discharging wastes directly into or near these tidewaters. The present water quality is shown in Figure IX-2. Except in the tidehead portions of the tributaries, the dissolved oxygen concentrations are generally high. The present quality is governed mainly by the poor aesthetic quality created by oil, grease, floating solids, color and turbidity. Although the degree of bacterial pollution precludes the harvesting of shellfish, it does not form the basis for the present Class D quality. The classification of these waters to Class B will require abatement of all sources of pollution, both industrial and municipal, by treatment methods comparable to secondary treatment. Because of the complexities of the flows which may exist in this area and the possible interaction of pollution from various sources, the designation of priorities for pollution abatement from specific sources has not been attempted. There is need, however, for appropriate studies to determine flow patterns and to ascertain if sources of pollution are contributing floating refuse.

The degree of pollution problems along the New Hampshire coast is unknown. The major direct contributor which could affect the quality is the resort area of Hampton, New Hampshire; this area currently provides secondary treatment to all of its wastes. There are also many individual outlets which could affect the local water quality. There is an immediate need to determine the present quality of the waters and, possibly more important, to determine the effect that Piscataqua and Merrimack River discharges may have on pollution because of littoral currents.

COSTS

Estimates of costs for recommended pollution abatement measures have been based on provisions for secondary treatment, including disinfection, of all waste discharges. The estimates shown in Table IX-2 and IX-3 were prepared by FWPCA utilizing costs obtained from consulting engineering and state classification reports, state agencies, and generalized treatment plant cost curves. These costs have been adjusted where necessary. These estimates serve only to indicate the order of magnitude of financial investment needed to abate pollution on the interstate streams of a basin and do not replace the more detailed estimates developed as a result of engineering studies for specific municipalities or industries. Pollution abatement facilities for sources discharging wastes to the interstate waters of the Piscataqua River Basin will require a minimum expenditure of approximately $16,000,000.

Estimates for institutional practices recommended in the Summary section of this chapter have not been presented.

Table IX-2

PISCATAQUA RIVER BASIN

Salmon Falls River

Recommended Abatement Measures and Estimated Costs

Source[1]	Recommended Treatment	Estimated Cost[2]	Remarks
Wakefield, N. H. (M)	Secondary	$ 105,000	
Milton, N. H. (M)	"	248,000	
Milton Leather Co. (I)	"	*	*Included with Milton
Greene Tannery Co. (I)	"	Undet.	
Spaulding Fibre Co. (I)	"	66,000	
N. Rochester, N. H. (M)			
Spaulding Fibre Co. (I)	"	52,000	
E. Rochester, N.H. (M)	"	310,000	
Baxter Woolen Co. (I)	"	120,000	
Berwick, Me. (M)	"	1,100,000	
Prime Tanning Co. (I)	"	*	*Included with Berwick
Somersworth, N. H. (M)	"	2,100,000	
General Electric (I)	"	52,000	
Great Falls Bleach & Dye Wks. (I)	"	1,000,000	
S. Berwick, Me. (M)	"	92,000	
Rollinsford (Salmon Falls), N.H. (M)	"	200,000	
American Twine Co. (I)	"	11,000	
Shoe Factory (I)	"	8,000	
Total (Table IX-2)		$5,464,000	

1. Parenthetical M and I following the listed waste source indicate municipal or industrial sources, respectively.
2. Estimated costs for municipal waste sources include costs for waste treatment facilities and interceptors, where required. Estimated costs for industrial waste sources include costs for waste treatment facilities only.

Table IX-3

PISCATAQUA RIVER BASIN

Coastal Waters Including Piscataqua River

Recommended Abatement Measures and Estimated Costs

Source[1]	Recommended Treatment	Estimated Cost[2]	Remarks
Eliot, Me. (M)	Secondary	$ 330,000	
Portsmouth, N. H. (M)	"	269,000	
Wentworth Acres (M)	"	133,000	
Pease AFB (F)	"	275,000	
National Gypsum (I)	"	11,000	
Simplex Wire & Cable (I)	"	24,000	
Kittery, Me. (M)	"	1,962,000	
Portsmouth Naval Shpyd. (F)	"	*	*Included with Kittery, Maine
Admiralty Village (M)	"	115,000	
Durham, N. H. (M)	"	270,000	
Dover, N. H. (M)	"	1,600,000	
Newcastle, N. H. (M)	"	526,000	
Total (Table IX-3)		10,979,000	
Total (Table IX-2)		5,464,000	
TOTAL		$16,443,000	

1. Parenthetical M, I and F following the listed waste source indicate municipal, industrial or federal sources, respectively.
2. Estimated costs for municipal waste sources include costs for waste treatment facilities and interceptors, where required. Estimated costs for industrial waste sources include costs for waste treatment facilities only.

RECENT PROGRESS IN POLLUTION CONTROL

The pollution problems of the interstate waters of the Piscataqua River Basin are recognized by the municipalities and industries in the area. Prior to 1960, at least four industries contributing wastes to the Salmon Falls River constructed facilities which abated their pollution to some degree.

Almost all of the municipalities contributing to the pollution in both Maine and New Hampshire have undertaken either engineering studies or have actually constructed facilities. Federal installations have completed studies for upgrading present treatment plants; and where treatment is not presently done, studies have been completed for combining wastes from these facilities with proposed municipal facilities.

The Maine and New Hampshire Water Improvement Commissions have made recommendations to their Legislatures with respect to the classification of these waters based on standards of quality and use. In 1960, the Commissions recommended that the Salmon Falls River, Piscataqua River and tidewaters be classified as Class B-1 (Maine and New Hampshire standards). This classification is similar to Class B of the New England Interstate Water Pollution Control Commission criteria shown in Appendix A.

In addition, a coliform limit of 70 MPN/100 ml was recommended for adoption for tidewaters where shellfish are harvested. In 1965 the Maine Legislature adopted legislation which classified these waters as Class SB-1 and B-1 for salt and fresh waters, respectively. New Hampshire, in 1961, adopted legislation classifying the waters as Class B-1. The adopted legislation imposes a coliform limit of 240 MPN/100 ml.

Maine and New Hampshire both provide funds for grant-in-aid programs amounting to 30 and 40 per cent of the cost of the project, respectively. The New Hampshire grant-in-aid program was increased from 30 to 40 per cent during the 1965 legislative season.

Within the last five years, the FWPCA has authorized grants-in-aid for the construction of treatment facilities and laterals for municipal facilities in New Hampshire amounting to $5,943,000. These facilities have been constructed or are under construction at Portsmouth, Hampton, Dover, Durham and Exeter. In addition, FWPCA grants have been approved for projects with a combined cost of $1,147,000 in Somersworth and Rollinsford, New Hampshire; construction of these facilities has not yet started. A similar grant for facilities in South Berwick, Maine, with a construction cost of $375,000 has been made by the FWPCA.

BACKGROUND FOR RECOMMENDATIONS

Pertinent Basin Characteristics

The interstate waters of the Piscataqua River Basin consist of the Salmon Falls River, Piscataqua River, Great and Little Bay areas, and the New Hampshire seacoast. Although the Piscataqua River is essentially an extension of the Salmon Falls River, the tidal action present in the Piscataqua indicates that the Salmon Falls River, Piscataqua River and Bay area should be considered as separate entities. The waters along the coast of New Hampshire have also been considered separately.

The Salmon Falls and Piscataqua Rivers, with their headwaters at Great East Lake, form a portion of the boundary between Maine and New Hampshire and flow some thirty-nine miles before emptying into the Atlantic Ocean. These rivers and the New Hampshire coast drain some 290 square miles of Maine and 640 square miles of New Hampshire.

Flows of the Salmon Falls River are controlled by four industrial hydroelectric dams and by three public utility hydroelectric installations. These seven facilities, located in the reach of the Salmon Falls River between Milton, New Hampshire, and tidehead, contribute to the river's regulation. Although river flows at South Lebanon, Maine, average 241 cfs, average minimum flows during significant periods in the summer have consistently been below 100 cfs. From its source to Milton, New Hampshire, the Salmon Falls River is an attractive stream. Downstream of Milton, discharges of sewage and industrial wastes degrade the stream for varying distances. Industrial development along the Salmon Falls River has been mainly in textile and leather oriented industries.

The tidewater of the Piscataqua River and the Bay area cover about twenty-four square miles and experiences an average tide range of about six feet. Municipal and industrial wastes significantly degrade the quality of the waters in this area. This area's industrial makeup is similar to that along the Salmon Falls River.

The twenty-mile coast of New Hampshire contains popular seacoast recreational areas including Hampton Beach. The effect of any pollution on the quality of these coastal waters is generally unknown except for the small bay area in the vicinity of Hampton, New Hampshire, where the water is degraded by wastes from the Hampton River.

Present Water Quality

The present quality of the interstate waters of the Piscataqua River Basin is shown in Figure IX-2, and the waste contributors affecting this quality are shown in Tables IX-4 and IX-5. The quality as shown was determined after analyses of data from various sources including the classification reports of the waters of the Piscataqua River Basin prepared by the States of Maine and New Hampshire. The quality of the Salmon Falls River, as described in the classification reports of Maine and New Hampshire, differ from the present quality assigned to certain reaches of the river. These differences may be attributed to a time differential between the studies of the respective states or may indicate that actual quality differences do exist between the Maine and New Hampshire sides of the river. In general, data from the Maine Classification Report indicates that a slightly better water quality exists from Milton, New Hampshire, to Somersworth, New Hampshire, than is indicated for the same reach by data of the New Hampshire classification study. The present quality of the Salmon Falls River as depicted by data contained in the New Hampshire Classification Report has been used in this report.

Because of differences between the two classification systems and for uniformity of presentation, an attempt has been made to show the quality of the waters in relation to the New England Interstate Water Pollution Control Commission Standards of Water Quality dated September 14, 1966. These standards of quality are shown in Appendix A.

The Salmon Falls River, from its headwaters to Milton, New Hampshire, is free of major pollution sources. At Milton, North Rochester and East Rochester, the introduction of municipal and industrial wastes degrades the river's quality to Class D in reaches immediately downstream of the source. The river's quality downstream from these pollution sources indicates a progressive recovery.

At Berwick, Maine, the already degraded quality of the river, the introduction of industrial wastes from the Prime Tanning Company and Great Falls Bleach and Dye Works, municipal wastes from a number of communities, and a dam located downstream of these sources contribute to a nuisance condition extending to tidehead. Visible solids, scum and oily slicks are present in this reach. Dissolved oxygen concentrations are at times entirely absent and there is high bacterial pollution.

The quality of the Piscataqua River and Great and Little Bays is affected by the industrial and municipal waste discharges of many sources discharging directly to or near these tidewaters. The present degradation to Class D is caused by undesirable floating solids, solids of sewage origin, oil slicks, general refuse and natural debris. Although both municipal and industrial pollution sources undoubtedly contribute to this condition, the disposal of wastes other than liquid by transient and abutting sources further adds to the present degradation.

The dissolved oxygen concentrations in the tidewaters are generally high, being in excess of 6 mg/l. In the tideheads of streams tributary to the bay, however, these dissolved oxygen concentrations are generally reduced because municipal and industrial waste discharges and bacterial pollution are generally more pronounced than in the bay area proper. The dissolved oxygen is reduced to levels on the order of 3 to 5 mg/l, but recovery of this parameter occurs before the tributaries empty into the bay. The bacterial pollution in the bay area precludes continuous harvesting of shellfish for direct marketing.

The extent of the tidewater area, the number of pollution sources, and the tidal action all frustrate attempts to single out individual sources which have the greatest effect on the present quality.

The present quality of the waters along the New Hampshire coast, except in the vicinity of Hampton and at the mouth of the Piscataqua River, is unknown. The quality of the coastal waters in the immediate vicinity of the Piscataqua River confluence is the same Class D as the discharging stream. In the vicinity of Hampton, New Hampshire, a small bay area is degraded to Class D because of objectionable amounts of floating solids from sewage and industrial wastes.

The pollution of lower reaches of the Salmon Falls River precludes or impairs the potential uses of the river for recreation, public water supply, and livestock watering. The pollution of the Piscataqua River and Bay area prevents the harvesting of shellfish and denies the use of the shores for many recreational purposes.

Table IX-4

PISCATAQUA RIVER BASIN

Salmon Falls River

Sources of Pollution

Source[1]	River Mile	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treatment	Waste Flow mgd	Waste Load, P.E. of BOD
Wakefield, N. H. (M)	33	1,223	100	Municipal	None	Undet.	100
Milton, N. H. (M)	24	1,418	400	Municipal	None	"	400
Milton Leather Co. (I)			45	Sanitary	Lagoon	"	200
Green Tannery Co. (I)			70	Tanning & Dye	"	"	Undet.
Spaulding Fibre Co. (I)			250	Sanitary & Dye	"	"	1,000
N. Rochester, N. H.							
Spaulding Fibre Co. (I)			100	Sanitary & Dye	"	"	800
E. Rochester, N. H. (M)	15	1,200	1,000	Municipal	None	"	1,000
Baxter Woolen Co.			200	Wash,Bleach,Dye	"	"	2,400
Berwick, Me. (M)		1,557	400	Domestic	"	"	400
Prime Tanning Co. (I)			150	Tanning	"	"	24,000
Somersworth, N. H. (M)	12	8,529	3,000	Municipal	"	"	3,000
General Elec. Co. (I)			1,600	Sanitary	"	"	Undet.
Gr. Falls Bleach & Dye Wks. (I)			250	Wash & Dye	"	"	13,350
S. Berwick, Me. (M)	4	3,112	500	Domestic	Primary	"	Undet.
Salmon Falls (Rollinsford),N.H.(M)	6	1,210	800	Municipal	None	"	800
American Twine (I)			150	Sanitary	"	"	Undet.
Shoe Factory (I)			100	Sanitary	"	"	Undet.

---

1. Parenthetical M and I following the listed waste source indicate municipal or industrial sources, respectively.

Table IX-5

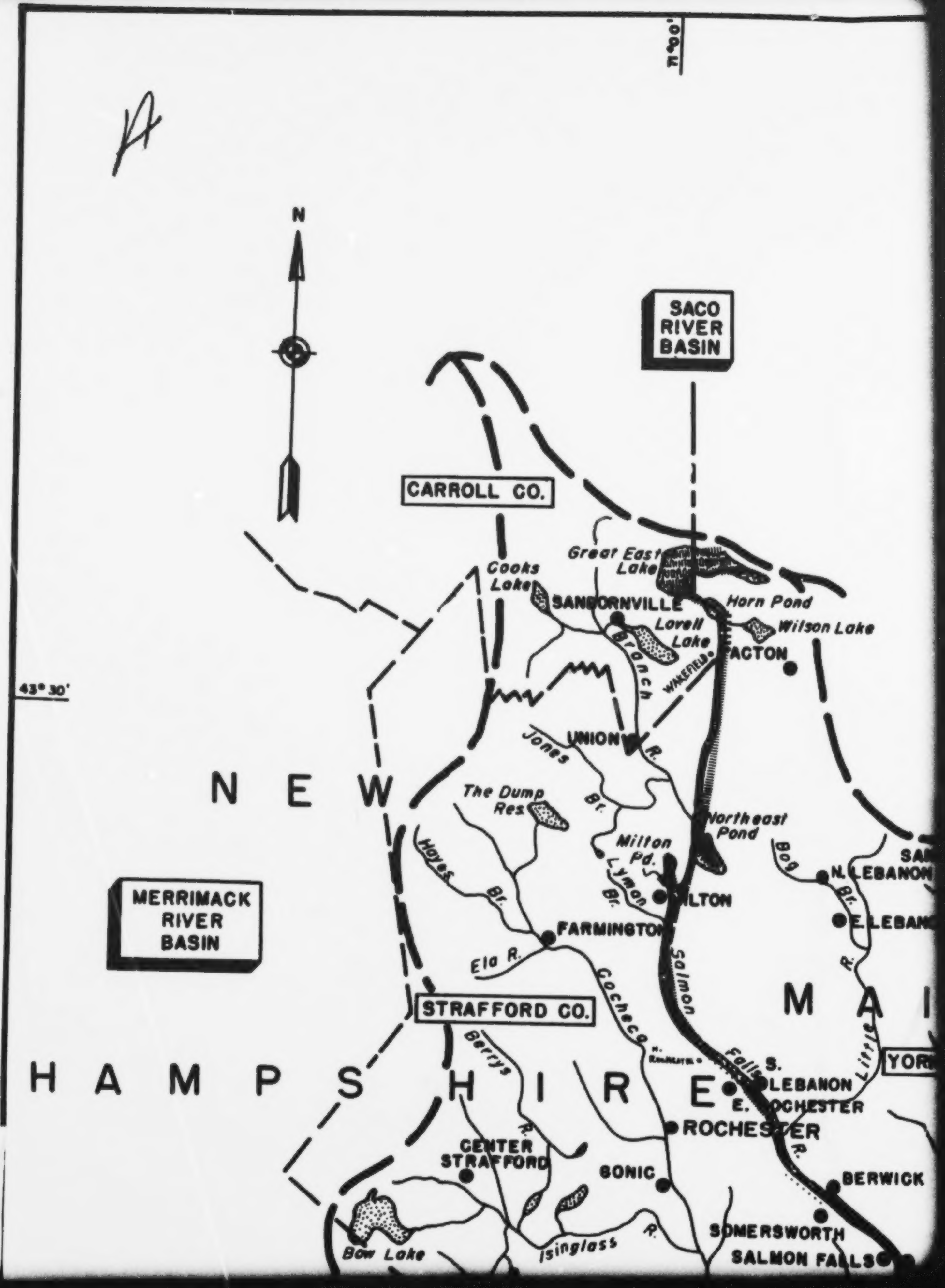
PISCATAQUA RIVER BASIN

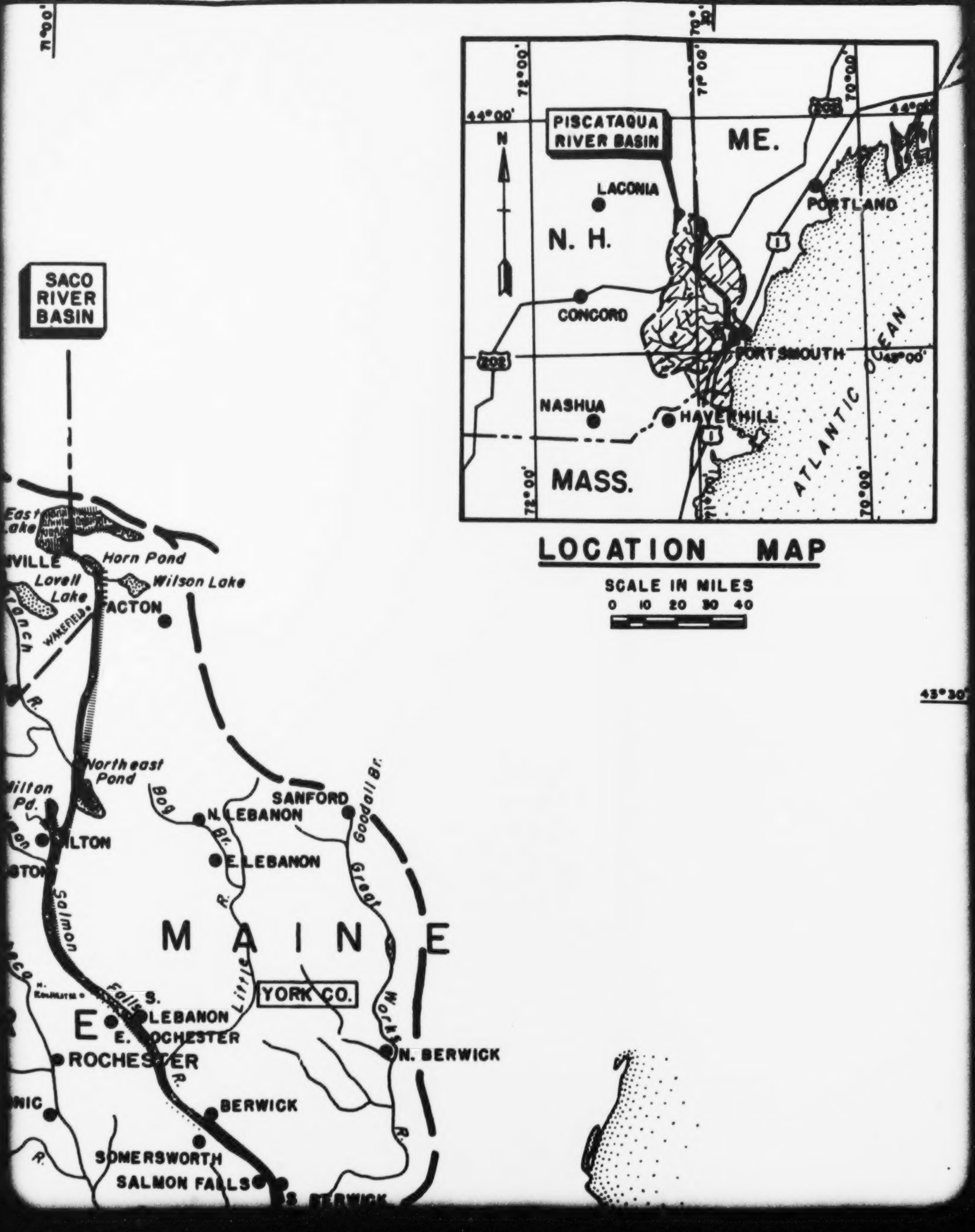
Coastal Waters Including Piscataqua and Hampton Rivers
Sources of Pollution

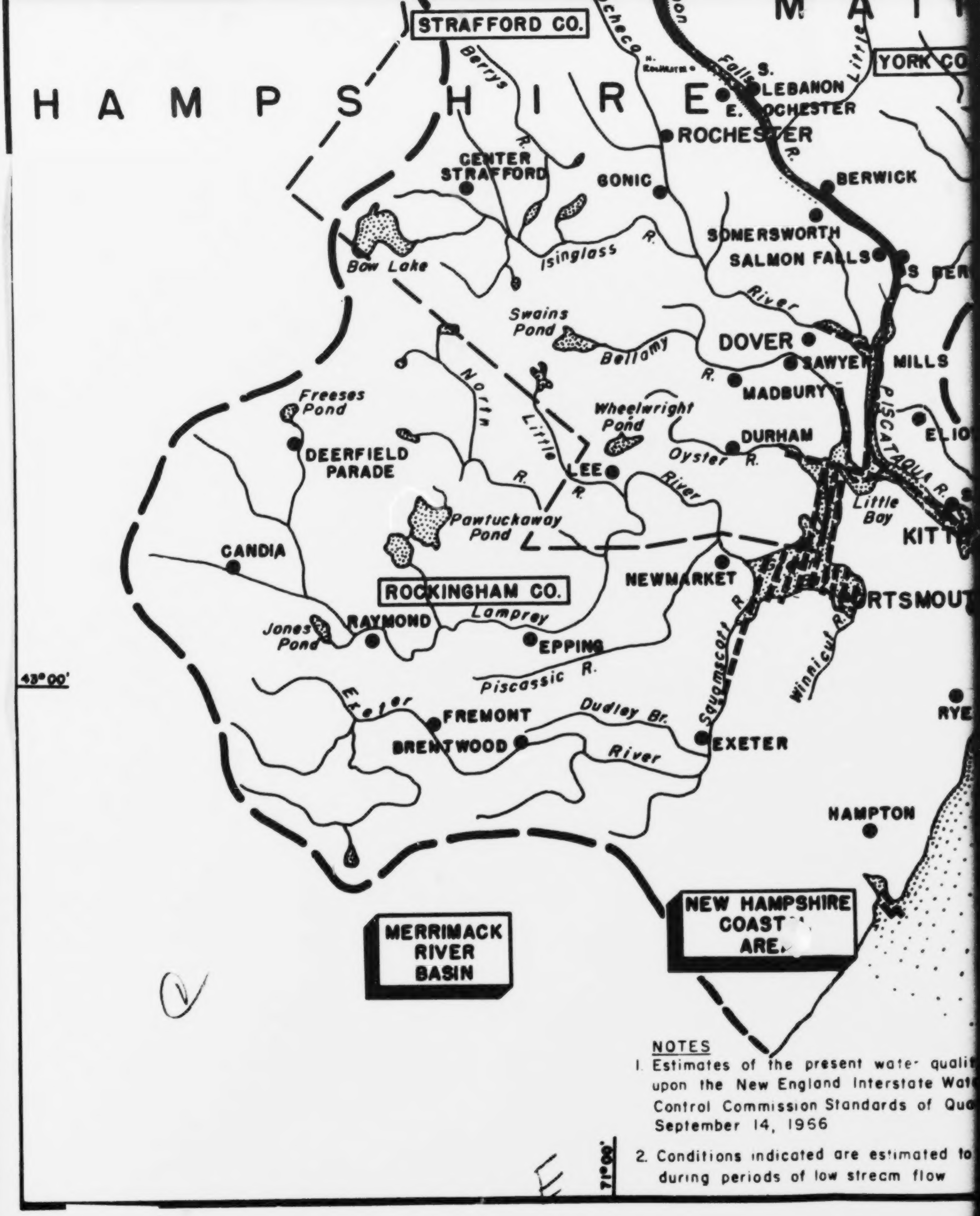
Source[1]	Receiving Water	1960 Pop.	Est. Pop. Served or Plant Employ.	Waste Type	Present Treatment	Waste Flow mgd	Waste Load, P.E. of BOD
Eliot, Me. (M)	Piscataqua R.	3,133	200	Domestic	Primary	Undet.	Undet.
Portsmouth, N. H. (M)	"	25,833	12,000	Municipal	Primary	Undet.	"
Wentworth Acres (M)	"	2,700	2,700	Domestic	Primary w/Cl_2	.270	"
Pease AFB (F)	"		Undet.	Municipal	Primary w/Cl_2	.350	600
National Gypsum Co.(I)	"		150	Sanitary	None	Undet.	Undet.
Simplex Wire & Cbl.(I)	"		500	Sanitary	Primary	Undet.	"
Kittery, Me. (M)		8,051					
Admiralty, Vil. (M)	"		2,400	Domestic	Primary w/Cl_2	Undet.	"
Portsmouth Naval Shipyard (F)	"		5,000	Sanitary & Indust.	None	.888	"
Hampton, N. H. (M)	Hampton R.	5,379	1,500[2]	Municipal	Secondary	1.30[2]	"
			10,000[3]	Municipal	Secondary	2.30[3]	"
Exeter, N. H. (M)	Squamscot R.	7,243	4,000	"	Secondary	.400	"
Durham, N. H. (M)	Oyster R.	5,504	5,000	"	Primary	.420	"
Dover, N. H. (M)	Cocheco R.	19,131	4,000	"	Primary w/Cl_2	.400	"
Dover, N. H. (M)	Cocheco R.	--	400	"	Secondary	.04	"
Newcastle, N. H. (M)	Piscataqua R.	823	600	"	None	.250	600

1. Parenthetical M, I and F following the listed waste source indicate municipal, industrial or federal sources, respectively.
2. Winter season population served.
3. Summer (tourist) season population served.

A


71°00'
N
SACO RIVER BASIN
CARROLL CO.
Great East Lake
Cooks Lake
SANBORNVILLE
Horn Pond
Lovell Lake
Wilson Lake
Branch
WAKEFIELD
ACTON
43° 30'
Jones Br.
UNION
R.
NEW
The Dump Res.
Northeast Pond
Milton Pd.
Bog Br.
N. LEBANON
SA
MERRIMACK RIVER BASIN
Hayes Br.
Lyman Br.
MILTON
E. LEBAN
FARMINGTON
Ela R.
Cocheco
Salmon
MAI
STRAFFORD CO.
Berrys R.
Falls
Little R.
YOR
HAMPSHIRE
S. LEBANON
E. ROCHESTER
ROCHESTER
CENTER STRAFFORD
GONIC
BERWICK
SOMERSWORTH
Bow Lake
Isinglass R.
SALMON FALLS

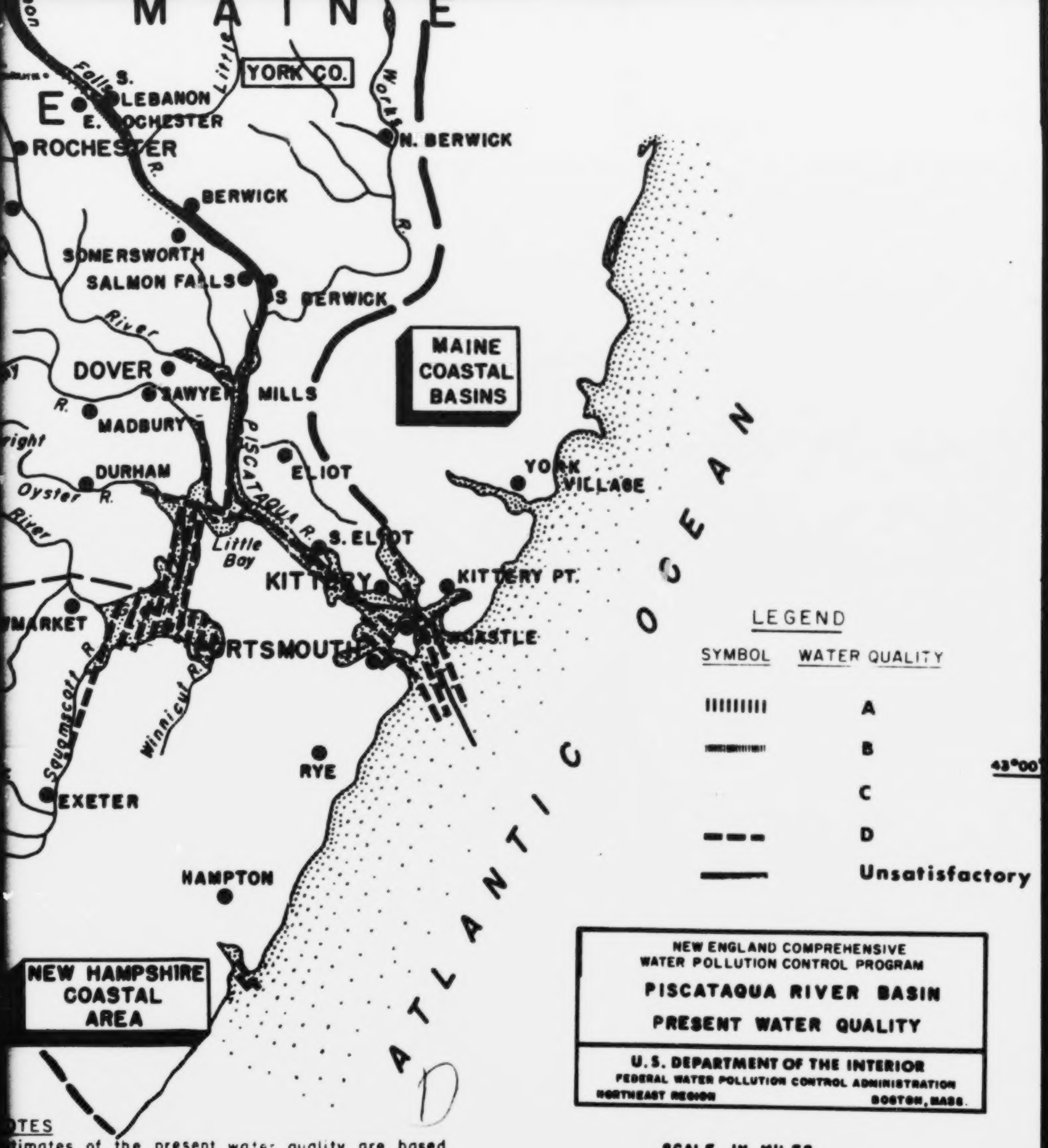

71°00'
SACO RIVER BASIN
East Lake
Horn Pond
Lovell Lake
Wilson Lake
ACTON
WAKEFIELD
R.
Northeast Pond
Milton Pd.
MILTON
Bog Br.
N. LEBANON
E. LEBANON
SANFORD
Goodall Br.
Great Works R.
MAINE
Salmon Falls R.
Little R.
YORK CO.
S. LEBANON
E. ROCHESTER
ROCHESTER
N. BERWICK
BERWICK
SOMERSWORTH
SALMON FALLS
S. BERWICK
43°30'
PISCATAQUA RIVER BASIN
ME.
N. H.
MASS.
LACONIA
CONCORD
NASHUA
HAVERHILL
PORTSMOUTH
PORTLAND
ATLANTIC OCEAN
N
44°00'
43°00'
72°00'
71°00'
70°00'
70°30'
202
1
LOCATION MAP
SCALE IN MILES
0 10 20 30 40


HAMPSHIRE
MAI
STRAFFORD CO.
YORK CO
Cocheco
Berrys R.
N. Rochester
Falls
S. LEBANON
E. ROCHESTER
Little
ROCHESTER
R.
CENTER STRAFFORD
GONIC
BERWICK
SOMERSWORTH
SALMON FALLS
Bow Lake
Isinglass R.
River
Swains Pond
DOVER
Bellamy R.
SAWYERS MILLS
MADBURY
Freeses Pond
North R.
Little R.
Wheelwright Pond
DURHAM
PISCATAQUA R.
ELIO
DEERFIELD PARADE
LEE
Oyster R.
River
Little Bay
Pawtuckaway Pond
KITT
CANDIA
NEWMARKET
ROCKINGHAM CO.
PORTSMOUT
Jones Pond
RAYMOND
Lamprey
EPPING
Squamscott R.
Winnicut R.
Piscassic R.
43°00'
Exeter
FREMONT
Dudley Br.
RYE
BRENTWOOD
River
EXETER
HAMPTON
NEW HAMPSHIRE COAST AREA
MERRIMACK RIVER BASIN
71°00'

NOTES

1. Estimates of the present wate- qualit upon the New England Interstate Wat Control Commission Standards of Qua September 14, 1956

2. Conditions indicated are estimated to during periods of low stream flow


M A I N E
YORK CO.
S. LEBANON
E. ROCHESTER
ROCHESTER
N. BERWICK
BERWICK
SOMERSWORTH
SALMON FALLS
S BERWICK
Falls
River
Little
R.
Works
R.
MAINE COASTAL BASINS
DOVER
SAWYER MILLS
R.
MADBURY
DURHAM
Oyster R.
River
PISCATAQUA R.
ELIOT
S. ELIOT
Little Bay
KITTERY
KITTERY PT.
YORK VILLAGE
WMARKET
RTSMOUTH
CASTLE
Squamscott R.
Winnicut R.
RYE
EXETER
HAMPTON
NEW HAMPSHIRE COASTAL AREA
ATLANTIC OCEAN
LEGEND
SYMBOL WATER QUALITY
A
B
C
D
Unsatisfactory
SCALE IN MILES
0
4
8
43°00'
70°30'

NEW ENGLAND COMPREHENSIVE
WATER POLLUTION CONTROL PROGRAM

PISCATAQUA RIVER BASIN

PRESENT WATER QUALITY

U. S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION BOSTON, MASS.

D

OTES
timates of the present water quality are based
on the New England Interstate Water Pollution
ntrol Commission Standards of Quality dated
ptember 14, 1966

nditions indicated are estimated to occur
ring periods of low stream flow

FIGURE IX - 2

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APPENDIX A

NEW ENGLAND INTERSTATE WATER POLLUTION CONTROL COMMISSION

WATER USE CLASSES AND STANDARDS OF QUALITY FOR INTERSTATE WATERS

(As Revised and Adopted September 14, 1966)

WATER USE CLASSES	DESCRIPTION	STANDARDS OF QUALITY						
		DISSOLVED OXYGEN	Sludge deposits – Solid refuse – Floating solids, oils, and grease – Scum	COLOR AND TURBIDITY	COLIFORM BACTERIA* per 100 ML.	TASTE AND ODOR	pH	ALLOWABLE TEMPERATURE INCREASE
CLASS A	Suitable for any high quality water use. Character uniformly excellent.	Not less than 75% saturation	None	None	Not more than 100	None	6.5 - 7.5	None
CLASS B	Suitable for bathing and recreational purposes. Acceptable for public water supply with appropriate treatment. Agricultural uses; excellent habitat; good aesthetic value.	Not less than 75% saturation	None	None	Not more than 1000	None in such concentrations that would impair any usages specifically assigned to this class	6.5 - 8.0	Only such increases that will not impair any usages specifically assigned to this class
CLASS C	Suitable for recreational boating; habitat for wildlife and common food and game fishes indigenous to the region; industrial cooling and process uses; under some conditions acceptable for public water supply with appropriate treatment.	Not less than 5 mg/l	None (see note 7)	None in such concentrations that would impair any usages specifically assigned to this class	None in such concentrations that would impair any usages specifically assigned to this class	None in such concentrations that would impair any usages specifically assigned to this class	6.0 - 8.5	Only such increases that will not impair any usages specifically assigned to this class
CLASS D	Suitable for power, navigation, and certain industrial uses.	Not less than 2 mg/l	None (see note 7)	None in such concentrations that would impair any usages specifically assigned to this class	None in such concentrations that would impair any usages specifically assigned to this class	None in such concentrations that would impair any usages specifically assigned to this class	6.0 - 9.0	Only such increases that the maximum temperature does not exceed 90° F.

* Sea waters used for the taking of market shellfish shall not have a median coliform content in excess of 70 per 100 ml.

NOTES:
1. These standards do not apply to conditions brought about by natural causes.
2. Class D waters will be assigned only where a higher water use Class cannot be attained after all appropriate waste treatment methods are utilized.
3. Any water falling below the descriptions and standards of quality for Class D shall be considered unsatisfactory.
4. Waters shall be free from chemical constituents in concentrations or combinations which would be harmful to human, animal, or aquatic life for the appropriate water use Class.
5. Radioactivity limits to be approved by the appropriate state agency with consideration of possible adverse effects in downstream waters from discharge of radioactive wastes; limits in a particular watershed to be resolved when necessary after consultation between States involved.
6. Above standards of quality shall not supersede more stringent water quality standards established by a signatory State.
7. Except such small amounts that may result from the discharge of appropriately treated sewage or industrial waste effluents.